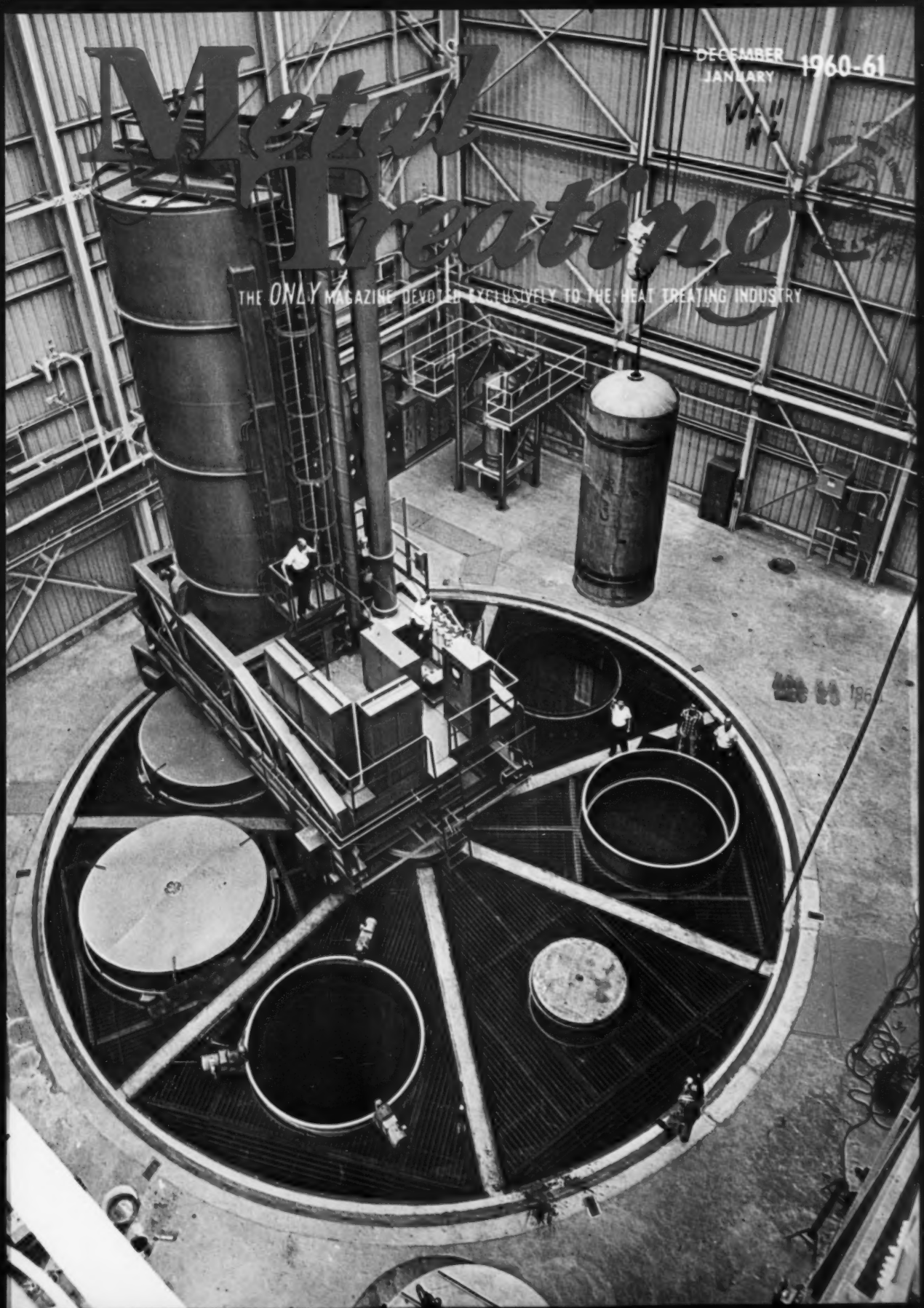

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About Our Cover

Gracing this month's cover is a towering 44 foot cylindrical structure which revolves like a "Lazy Susan" over a circular pit. The unit is the General Electric Company's latest contribution to the challenging rocket and missile industry. For the full story, see page 2.

COVER STORY

Precise Heat Treating Of High Strength, Thin Walled Rocket Cases

A giant electric furnace designed for precise heat treating of high strength, thin walled rocket cases has been put into operation by the General Electric Company. Largest of its kind ever built, the gantry type facility represents an investment of $1,250,000 by the firm's Flight Propulsion Laboratory Department.

The unit has already been used for heat treating jet engine parts and will soon go to work toughening up solid rocket cases for a major missile program.

The furnace can handle metal pieces up to ten feet in diameter, and 30 feet in length. In addition to rocket cases, the facility can heat treat other rocket engine components, nuclear engine parts, jet engine hardware, and any other large components whose size precludes treatment in smaller furnaces.

Main element of the new furnace, designed and built by GE's industrial heating department, Shelbyville, Indiana, is the high temperature gantry furnace. The towering 44 foot cylindrical structure is mounted on a motor driven carriage which revolves like a "Lazy Susan" over a circular pit. In the pit are two furnaces for combination preheat, tempering and stress operations. Salt, still air and water rinse-quench tanks and a loading station are also housed in the pit, along with atmosphere control equipment.

Work to be heat treated is transferred between the gantry furnace and the pit furnaces by means of a gas tight chain hoist system. This system extends down through the top and operates inside the furnace. The hoist mechanism is driven by a speed variator which provides hoisting speeds from five to 40 ft. per min. and lowering speeds from five to 60 ft. per min. Automatic and manual controls are provided for carriage travel and positive furnace-to-pit alignment.

Electrically heated by nichrome-alloy ribbon type heating elements, the furnace has a refractory lining and is specially insulated. With an operating range up to 2000 F. (2100 F. to 2200 F. for limited time intervals) the furnace can maintain a continuous temperature tolerance of ±10 F.

A high power rating of 1030 kw enables it to heat a four ton piece of steel from 1000 F. to 1500 F. in one hour. Four controlled heating zones within the furnace assure maximum temperature uniformity.

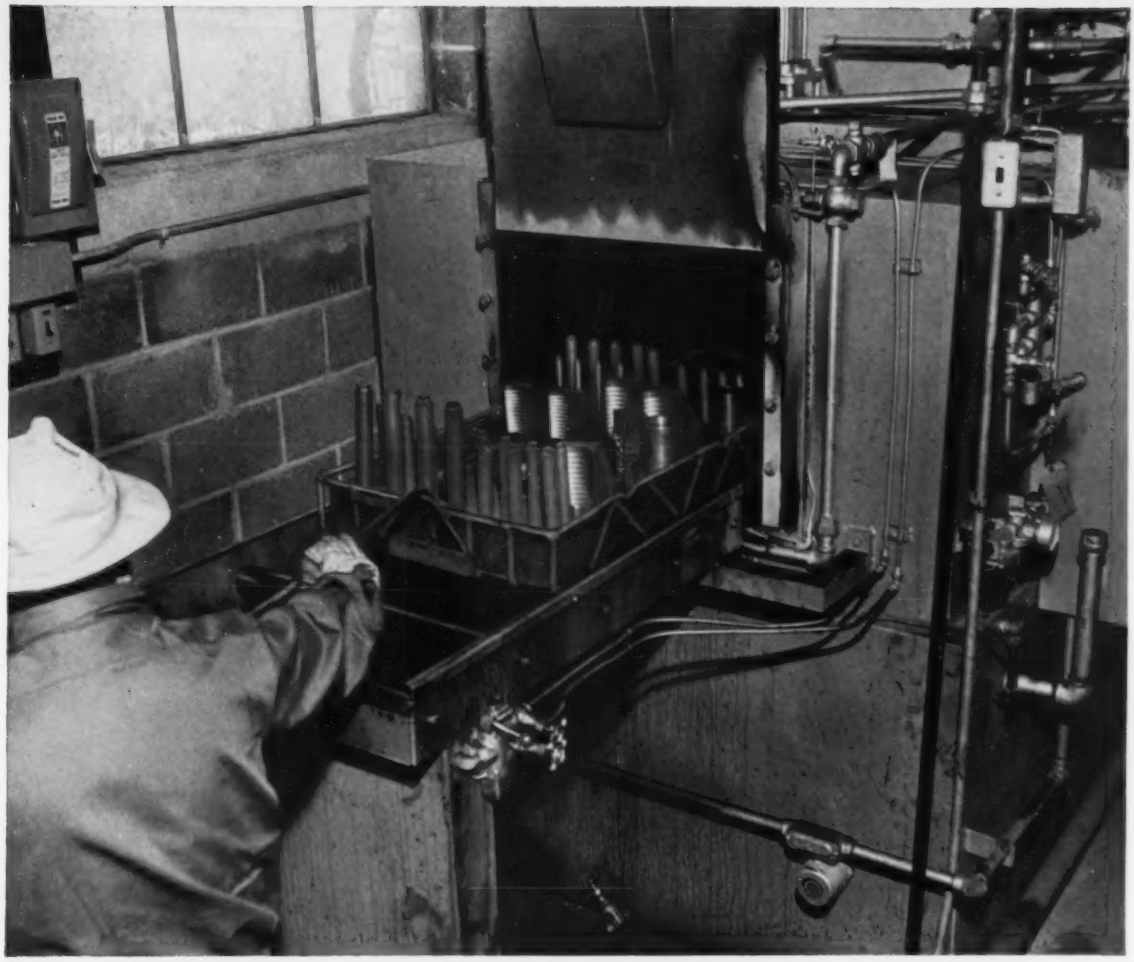
The operating temperature capabilities of the two pit furnaces range from 400 F. to 1400 F. with an accuracy of ± 10 F. Rated at 1,050 kw and divided into four zones of control, each refractory lined and insulated furnace is equipped with a 21,000 cfm recirculation fan to effect optimum circulation.

Both the salt quench and water quench rinse stations are vertically erected cylindrical steel tanks heated by four gas fired, radiant tube type immersion heaters. The salt quench equipment is designed for continuous operation at temperatures ranging from 300 to 1,000 F. Circulation of molten salt to all points of the work load is accomplished by three agitators. Total rated heating capacity is 2,500,000 BTU/hr.

The water quench rinse station provides water temperatures up to 180 F. Recirculation is provided by a motor-driven 250 gpm pump. Gas burners used with the water rinse heating tubes are rated at 312,000 BTU/hr. each, providing a total input of 1,250,000 BTU/hr.

Endothermic atmosphere gas for the gantry furnace is furnished by two Thermalene producers. A dew point controller mounted on each producer continuously samples the moisture content of the gas output. Automatic control of the dew point is effected by changing the ratio of gas and air input to the producer.

• • •



Rapid oil quenching hammers this Inconel basket with thermal shock during the heat treating cycles, but the basket remains strong and ductile. Cycles are automatic, with pre-set controls.

This Inconel basket shrugs off thermal shock at 1850°F

Can withstand 24-hour service in exothermic, endothermic, cracked ammonia atmospheres

It's a big order for any work basket: it must withstand 1850°F and repeated thermal shock during quenching. Moreover, it must endure the corrosive and embrittling effects of bright hardening, carburizing, and carbonitriding atmospheres.

That's why, for the past two years, Inconel* nickel-chromium alloy has been used in Clean-Line Heat Treat Furnaces built by Hevi-Duty Electric Co., Watertown, Wis. Inconel alloy withstands this sustained combination of thermal shock, high temperature attack and rough handling, but remains ductile enough for easy basket straightening. And it's easy to fabricate, too.

Two ways Inconel equipment can save you money

You can get longer service out of baskets, brazing trays, carriers and other fixtures, thanks to the way Inconel alloy keeps its strength at high temperatures in heat treating atmospheres. You get the benefit of its excellent forming and welding properties—which make long-life design practical. And you *save weight*, because the high strength of Inconel alloy permits lighter, easier-to-handle equipment.

For useful information about Inconel equipment, and for help in solving your material selection problems, write to us today. Ask for a copy of "Keep Operating Costs Down When Temperatures Go Up."

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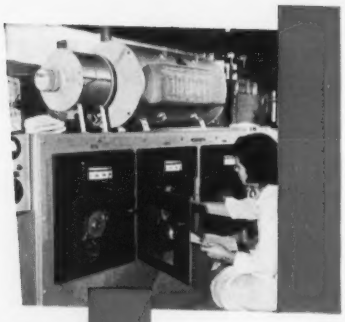

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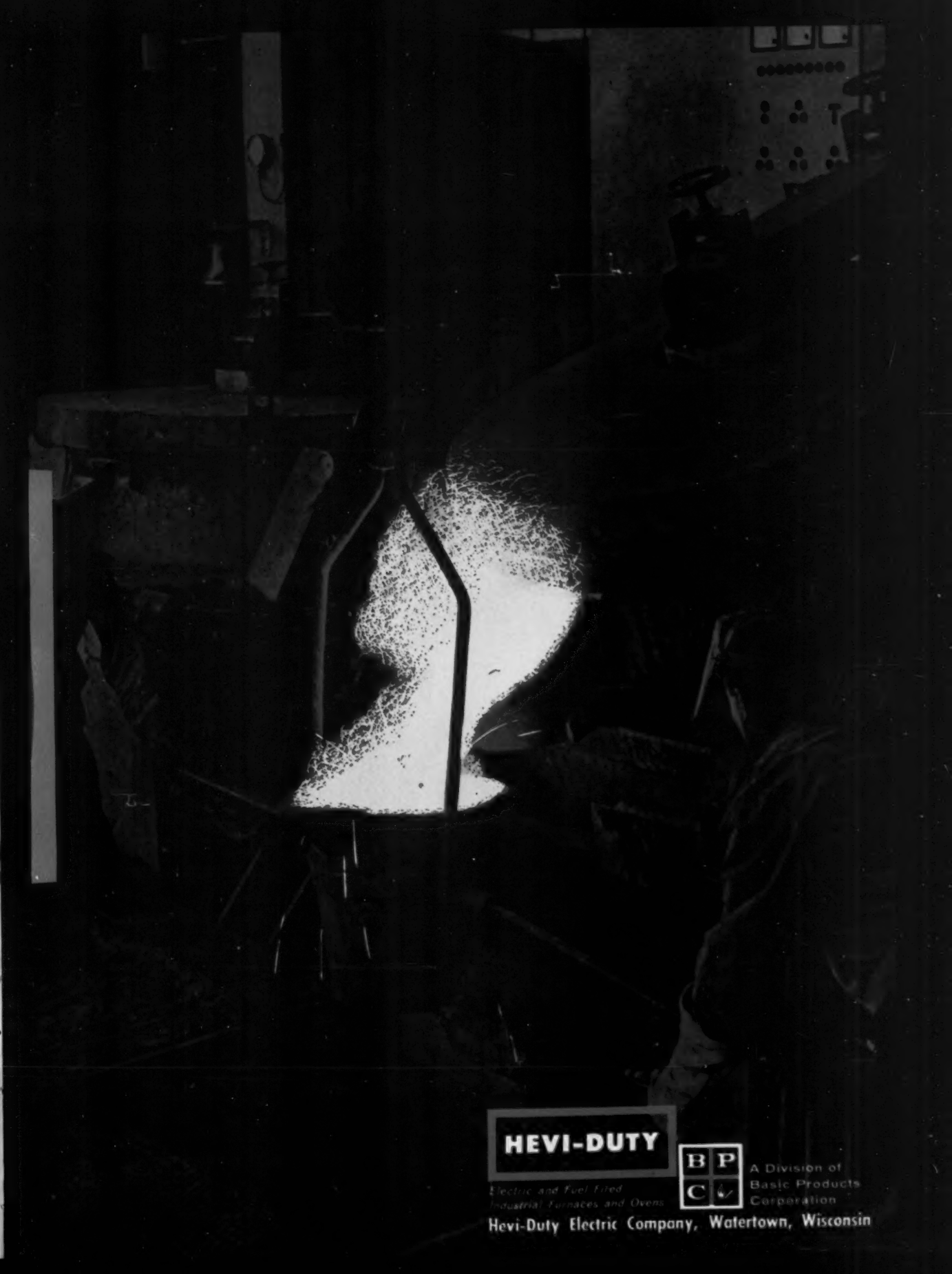

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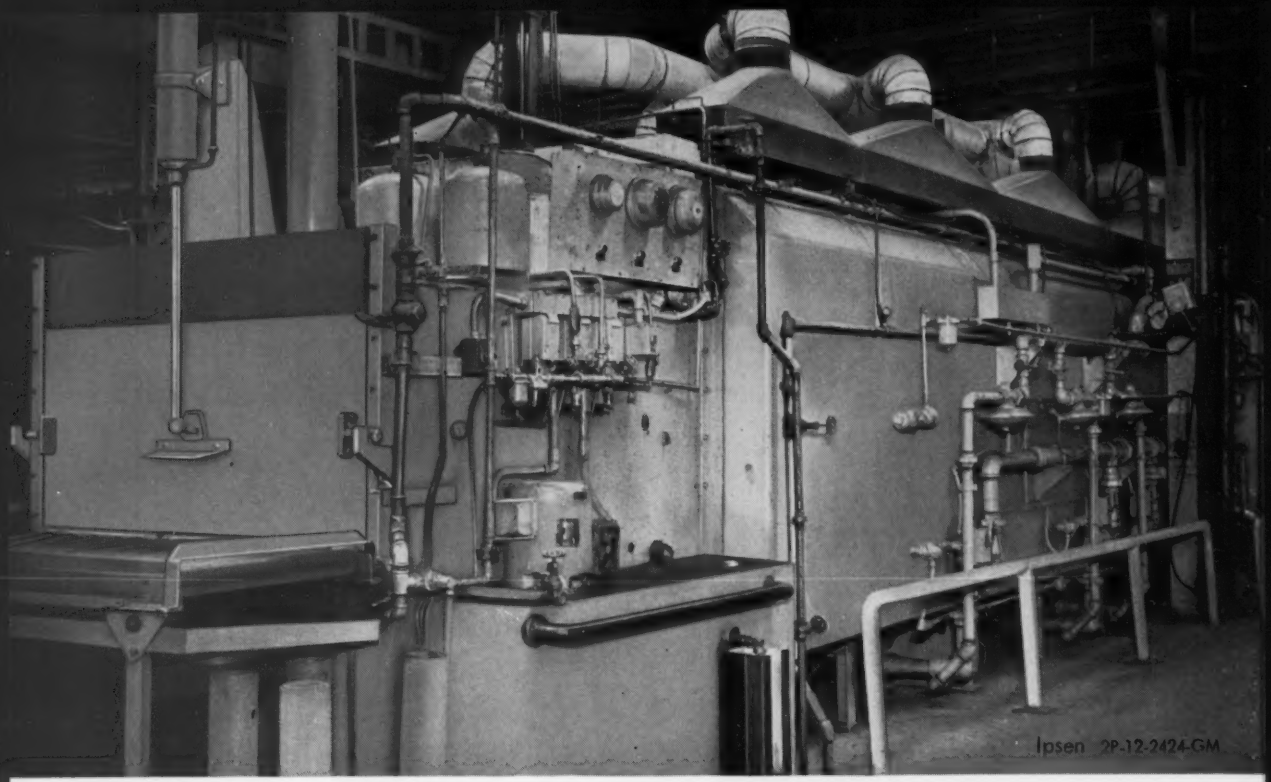


Production Carburizing

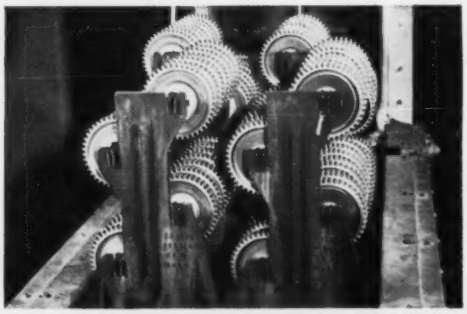
Five years ago the first Ipsen Double Row 4-Zone Pusher was built.. see photo above. It is now six years since the first Deep Case Carburizing Unit was built. BIG Ipsen controlled atmosphere pushers have given unexcelled metallurgical results!

Check these features when you consider a carburizing furnace. They are exclusive with Ipsen.

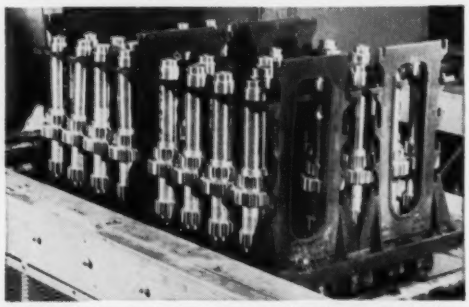
- Enclosed Charging Mechanism (Pat. No. 2,896,775)
- Chain Discharging Mechanism (Pat. No. 2,842,349)
- Baffles for 100% Forced Convection Heating (Pat. No. 2,788,205)
- Ceramic Heating Tube Mounting (Pat. No. 2,822,798)
- Ceramic "Flame-Busters" (Pat. No. 2,861,596)
- Ceramic Fan (Pat. No. 2,730,352)
- Water-Cooled Fan Motor (Pat. No. 2,800,317)
- Quench Oil Flow System (Pat. No. 2,854,013)

Other Patents Pending

Ipsen Pusher furnaces are described in Bulletin P-59. Send for your copy today.



This charge of steel gears is typical of work handled in Ipsen Production Carburizing Furnaces. Heating was 1700° F for 10 hours; oil quenched at 150° F. Case depth: .045".



Countershafts ready for charging into Ipsen Production Carburizing Furnace. Heating time was 10 hours at 1700° F; quenching was in oil at 150° F. Case depth: .045".

AUTOMATIC Ipsen HEAT TREATING UNITS

IPSEN INDUSTRIES, INC. • DEPT. 33 • P.O. BOX 500 • ROCKFORD, ILLINOIS

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CONTINUOUS ANNEALING . . .

INCREASES PRODUCTION OF MOTOR LAMINATIONS

IRWIN SCHUMAIER
Manager, Standards Division
Century Electric Company
Saint Louis, Missouri

Problem

WHEN SHARP INCREASES in demand for several of its electric motors called for a sizable boost in production of stator and rotor laminations (Fig. 1), the Century Electric Company was confronted with the problem of taking steps to achieve the necessary expansion. The solution appeared to lie in the answer to the three questions:

1. Would two additional batch annealing furnaces suffice to put lamination production lines on a continuous basis, and meet the new volume requirements for motors used in fans, blowers, pumps, air conditioners, oil burners, and the like?
2. Could construction and installation costs for two more such furnaces be kept within budget allotments for this operation?
3. Could two furnaces, large enough to fulfill production requirements, be squeezed into the limited space available?

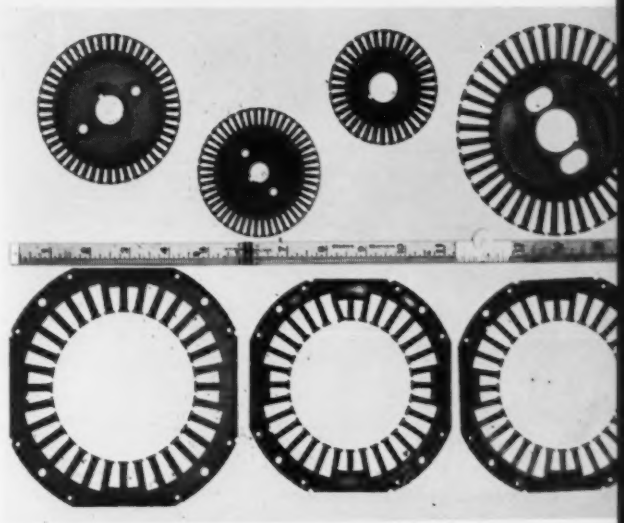

FIG. 1. A few of the many different types and sizes of stator and rotor laminations for electric motors that are annealed in the Selas automatic heat processing machine.

Solution

With the possibility that new developments might be available to offer a better solution, rather than simply adding to our present equipment, we turned to Selas Corporation of America, Dresher, Pennsylvania, an organization of industrial heat processing specialists.

After putting the problem to test in their laboratory, the Selas engineers came up with a unique solution, which reduced formerly estimated heating equipment needs from two furnaces to *one conveyorized machine*. The unit anneals approximately 90 stacks of either rotors or stators, 1800 lb. per hr., and is equipped with change-over fixtures to handle a wide range of lamination sizes from 2½ in. to 10 in. O. D.

The complete annealing operation for each stack of laminations in the machine is only 35 min., as compared with the three hr. soak required with the batch furnace method. Annealed workpieces are unloaded from the conveyor, without a stop, at the rate of one every 40 seconds. Other operations along the production line are no longer held up waiting for a large batch to be finished. Instead, they continue at a steady pace.

After each six in. high, wired stack of laminations is placed on one of the conveyor's rotating spindles, it is carried into the entrance of the heating tunnel, as shown in Fig. 2. Each wall of the narrow, six ft. long tunnel is lined with individually controlled Duradiant

FIG. 2. Closeup of machine installed and in operation shows operator loading stacks of rotor laminations onto fixtures, and workpieces entering heating tunnel. Complete heating and cooling cycle for each stack takes only 35 min. Selas Combustion Controller and two Minneapolis Honeywell instrument panels used in operation are at right.

Pereco Furnace
with
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for continuous operation at temperatures up to
2900° F.

"Provides the Higher Temperatures now needed in experimental fabrication and heat treating studies"

That's what one of the country's foremost research laboratories states when reporting on the use of their new Pereco Kanthal Super Element Furnace, illustrated above. Mounted on casters, this Model FGKS combines the accuracy and flexibility of heat control with the mobility of equipment so desirable in laboratory work. Tell us of your work requirement. One of Pereco's LINE of Kanthal Super Element Furnace might be just what you need.

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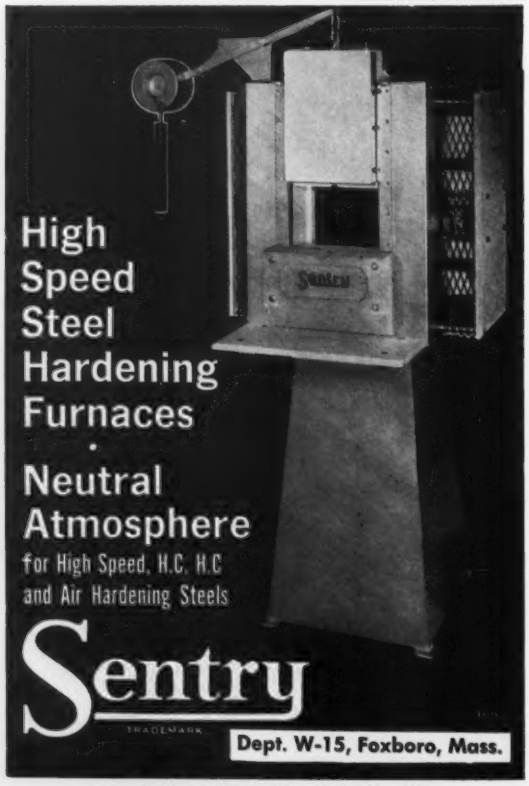

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burners. It takes only 12 to 15 min., depending on the diameter of the rotors or stators being processed, for each stack to be heated to 1400 F.

This speed of heating is made possible by the Gradiation principle used. The burners are supplied accurately proportioned, pre-mixed gas and air by a Selas Combustion Controller. The automatic fuel proportioning unit takes natural gas from the low pressure plant line, draws air from the room, mixes the two and compresses them to several pounds pressure for delivery, at a pre-set ration and pressure, to the burners.

The burners create radiant heat by burning these closely controlled gas-air mixtures against special cup shaped refractory surfaces (Fig. 3). The cup surfaces, in turn, beam the radiant heat to the stator and rotor laminations.

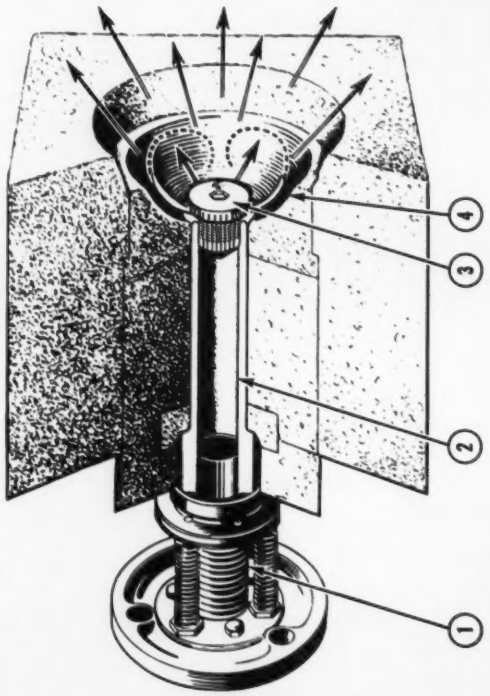


FIG. 3. Diagram of Duradiant burner operation showing flexible mounting of burner tube, which permits burner to follow wall expansion (1); gas-air mixture enters tube (2); moves to burner tip (3); passes through tip and burns radially on refractory cup surface (4).

Greater speed in the annealing of the lamination stacks is achieved by a combination of the high thermal head and close proximity of the heat source to the workpieces. Such proximity is possible because the burners produce no harmful flame impingement, combustion being completed entirely within each refractory cup.

Following the rapid heating cycle, the conveyor carries the stacks of laminations around the far end of the machine and into a controlled cooling tunnel on the

Concluded on page 43

Is it Costing You Money to put off a pension plan for your key men?

I. AUSTIN KELLY, III, President
National Employee Relation Institute

EDITOR'S NOTE: Usually METAL TREATING confines its editorial content to technical processes and procedures involving heat treating. Occasionally, however, something comes to us which has such a general interest to all people involved in plant operation, whether it be heat treating or other production, that we like to pass it on to our readers. This article is an example.

About The Author

I. Austin Kelly, III, is founder and president of the National Employee Relation Institute, Inc., an independent national organization serving the needs of national trade associations and their members. Specializing in small and medium size company plans for 27 years, the organization now operates more than 300 pension and profit sharing plans.

IF YOU have ever sat through the sales patter of an average pension salesman, you know that when he finishes the glowing descriptions of all the benefits his plan offers, the price tag he finally hangs on it will be a whopping one. And when someone is asking you to put *thousands* of dollars into a program, it's easy to lose interest in a hurry.

But don't congratulate yourself too quickly on the money you've saved. Not having a plan may be the *most expensive* economy you ever made.

Take the case of one of our present clients in the metal treating field. I won't mention their name, because you would probably recognize them. Call it the XYZ Company.

It's a small firm owned almost entirely by one man. This gentleman had been talking, off and on, with insurance salesmen about a pension plan for about four years. But that is as far as it had gone. Just talk. With an expanding business, he feared that his cash position was too tight to invest in a retirement program.

The situation that brought him to us was the sudden resignation of his plant manager to take a job with a competitor. Naturally, the XYZ company made an effort to change the man's mind. In fact, the man in question actually turned down a *$4,000 salary increase!* Why? *Because the competing firm had a pension plan.* He had carefully computed his tax situation and decided that the pension was worth more to him than the raise!

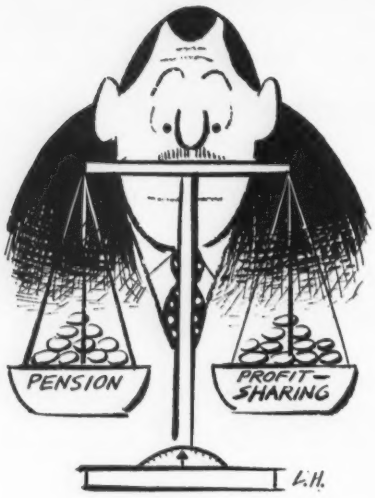
This was only the first loss which XYZ's owner incurred. By the time we sat down and figured what his own personal benefits could be under a well designed pension plan, he saw that he was not only risking the loss of valuable key men, but also passing up an opportunity to nearly double the net amount of any additional profits he might wish to take out of company earnings for himself.

The chart shown on these pages is approximately the same as the one we drew up for him at our first meeting. Just for fun, try it on your own situation and see how much you may be losing, personally, by putting off this tax-free form of deferred compensation.

Now, perhaps your sharp eye caught the qualification which I placed on the pension plan we used as our illustration for this company owner. I hope so, because I don't want to be accused, at some later date, of saying that these advantages can be found in any pension plan. And picking the wrong plan can be a very expensive mistake.

The easy way to avoid such a mistake is to recognize, at the outset, that the right plan for your company does not yet exist! You can't simply copy someone else's plan. No matter how good it is for them, it won't work for you in the same way, because your requirements are bound to be different. Nor can you depend on finding a "stock model" plan that will fit your needs. These plans invariably begin with the method of funding, because it is the funding organization—an insurance com-

. . . A PENSION PLAN



PROBLEM: The owner of a small close corporation, age 55, desires to withdraw a sufficient amount from his company's earnings during the next ten years to create a fund with which to retire. He feels that he can safely withdraw as much as $30,000 a year, before taxes.

ONLY TWO PLANS ARE AVAILABLE

PLAN A	TAX RESULT
Withdraw as much as possible of the $30,000 as additional income for each of the next ten years.	From the earnings of the corporation $30,000. 52% tax bracket 15,600. Left after taxes $14,400. In order to withdraw the $14,400 it must be declared as additional salary. 50% personal income tax bracket $ 7,200. Maximum amount possible to withdraw $ 7,200. Result at end of 10 years Maximum amount possible to accumulate in a Fund $72,000.
PLAN B	Out of the total contribution of $30,000 to fund the Pension Plan, an amount of $15,000 is deposited to the owner's account. a) There is no tax on the $30,000 as it is written off as a corporate deduction. b) The money deposited each year is not reported as taxable income for the owner and other participants. Result at end of 10 years Amount accumulated to owner's credit in Fund $150,000.
PLAN B YIELDS TWICE AS MUCH	

* The same idea applies to companies and owners in lower tax bracket.

Owner's total cash under Plan:	B	$150,000.
	A	72,000.
OWNER'S GAIN UNDER PLAN	B	$ 78,000.

pany, a bank, an investment firm—that is paying the salesman's commission.

The logical place to start is not with the plan's funding, but with its functions. What do you want it to accomplish? Begin by setting down your requirements. Whom do you want in the plan? How much do you want them to receive in benefits? How much can you afford to invest annually? What particular flexibility do you want built into your plan? (This is vital, because you certainly don't want to commit yourself to fixed annual deposits; suppose business takes a turn for the worse?)

Only after you have made these decisions, and the plan has been designed to meet your specific requirements, should you think of how it can best be funded. Usually the plan itself will suggest the answer, or you can look at cost comparisons and other factors and determine the most desirable method. This may turn out to be a combination of two or more different methods.

Now you are probably thinking, "But that's a custom-made plan. It's going to be expensive."

A logical thought, yet the real facts are usually exactly the opposite. Unlike custom tailored clothes, an individually designed pension plan generally costs less than the typical "stock model." This is because you aren't paying for unnecessary extra "frills." By having a plan designed especially for your company, you not only decide what you want in it, but what you want left out.

One good example is the "past service" feature found

Cartoons courtesy of *Plumbing and Heating Business* magazine.

in so many "stock model" plans. This is intended as a reward for older employees who have been with the firm for 10, 20 or more years. A good idea? Sure, if your budget can stand a lump sum deposit of $40,000 or $50,000 (and sometimes it's a lot higher, depending on the number of such employees on your staff). Or perhaps the bank or insurance company will let you make this payment on an installment basis over three to five years, with interest on the unpaid balance. That's expensive, too.

An individually designed plan, on the other hand, can offer you other ways to give adequate recognition for past service—ways that are far less costly and still satisfy these older employees.

Another money saving provision is a schedule of pension benefits that ties in directly with Social Security. You simply decide on the total amount of retirement income you wish your people to have—say 40% of salary—and specify that the first chunk of this will be furnished by each person's Social Security benefits. Your plan simply makes up the difference. This feature will also protect you against future increases in Social Security costs.

How do you go about the actual design of an individual plan? Well, it obviously is not a "do-it-your-

Concluded on page 43

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Lab-Size
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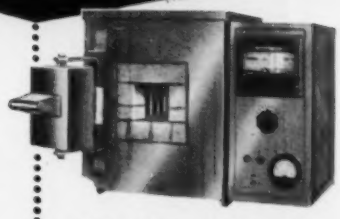

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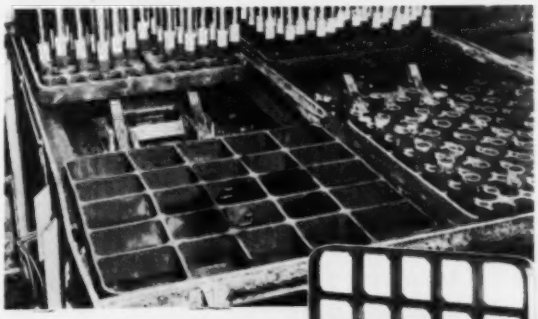
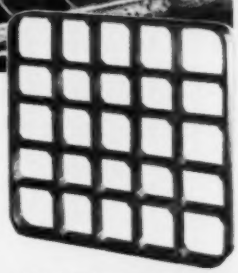
For further information circle No. 41

Wiretex BASE TRAYS *OUTLAST* CAST TRAYS 3 to 1



Tests at Ford's Indianapolis Steering Gear and Cold Heading plant proved Wiretex fabricated alloy trays saved many dollars, outlast other trays by more than 3 times. 26 months later, the trays were still in use, without replacement.



Another example of how WIRETEX solves special parts holding fixture problems.

Call Wiretex for all your heat treating requirements to resist acid, heat, abrasion or exposure.

Specialists in Processing Carriers Since 1932.
Wiretex mfg. co.,
16 Mason Street, Bridgeport 5, Conn.

For further information circle No. 42

WHAT WOULD YOU DO?

a problem in labor arbitration taken from the files of the American Arbitration Association

CASE OF THE SALARIED EXPERIMENTERS

Early in 1960, a sugar refining company in a southern state established a new experimental department, equipped it with a new type of granulator and staffed it with five salaried employees who were not members of the bargaining unit. The union immediately filed a grievance.

"Under the contract," the chief steward pointed out, "production work is to be done by hourly rated employees who are members of the bargaining unit. Even if they don't belong to the union, you have to bargain with us about their wages and conditions of work. You can't arbitrarily decide to carve certain work out of the unit and engage in individual bargaining."

"We recognized the union as the exclusive bargaining representative of all hourly rated employees," conceded the personnel manager, "but these five men are in another class. They are no different from engineering and research personnel we have always employed outside the bargaining unit. Besides, they're not taking any work away from union members. The sugar they work on eventually gets put back into the line for processing in the regular way by hourly rated employees."

Eventually, the case went to arbitration under the rules of the American Arbitration Association.

THE AWARD. The most important fact, the arbitrator said, was that none of the experimental work was used to fill company orders. Consequently, bargaining unit employees lost nothing by it. "If the Company were to begin using the finished sugar produced in this new granulator to fill its orders, or to install the new type of granulators throughout the plant and staff them with salaried personnel, a different issue would be presented."

CASE OF THE REARRANGED SHIFTS

In negotiating a contract at a wire products plant, management and the union agreed that the established starting and quitting times wouldn't be changed "unless production or delivery requirements or extraordinary conditions require changes of hours for limited periods, in which case notice of such change will be given as far in advance as possible."

The 10 employees in the shipping department were fairly certain, therefore, that their 6 A.M. to 3 P.M. shift wouldn't be changed. But a few months later, it became apparent that there were times during the day when some of the shipping clerks had nothing to do. Yet rush orders coming in late in the afternoon had to be done on an overtime basis or put off to the next day. So the company posted a notice to the effect that beginning the following month, half the shipping clerk employees would be on a 3 P.M. to 12 midnight shift.

The union filed a grievance. "The contract doesn't permit changes in shifts except in emergencies," said the international representative. "This is just a trick to cheat the men out of overtime."

"Look at the contract again," answered the industrial relations director. "It says we can change starting and quitting times in accordance with 'delivery requirements.' When our customers order supplies late in the day it requires us to oblige them."

Eventually, the case went to arbitration under the rules of the American Arbitration Association.

Concluded on page 43

What HORACE DREVER has to say about Lindberg heat treating equipment

Mr. Horace Drever, internationally prominent in the industrial heating field, is a Past-President of the Furnace Manufacturers Association and President of Drever Company, furnace manufacturers and commercial heat treaters.

QUOTE from Mr. Drever's unsolicited letter to Lindberg Engineering Company

"For the past three and one-half years, we have been operating one of your Type 243618 GVRT Furnaces along with a 500 CFH Lindberg Hyen generator in our commercial heat treating division. We are extremely pleased, not only with the fine quality of work turned out by this equipment but also its relatively trouble-free operation. As evidence of our complete satisfaction we have ordered another Lindberg Furnace of this type."

DREVER COMPANY

Lindberg Furnaces in operation at the Drever Company, Bethayres, Pennsylvania.

We are happy that Mr. Drever, a furnace manufacturer in his own right, originally chose Lindberg equipment for his heat treating plant and that its satisfactory service prompted an additional order. The second Lindberg Furnace is now in production at Drever Company, as the adjacent photo shows. Bless those satisfied customers! If you have a product or process in the metal or ceramic field requiring the application of heat you can depend on Lindberg's engineering and design know-how to provide exactly the right equipment to answer your need. Get in touch with your nearest Lindberg Field Representative (see classified phone book) or write direct to Lindberg Engineering Company, 2466 West Hubbard Street, Chicago 12, Illinois. Los Angeles plant: 11937 South Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg, Ltd., Toronto.

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J. M. HODGE
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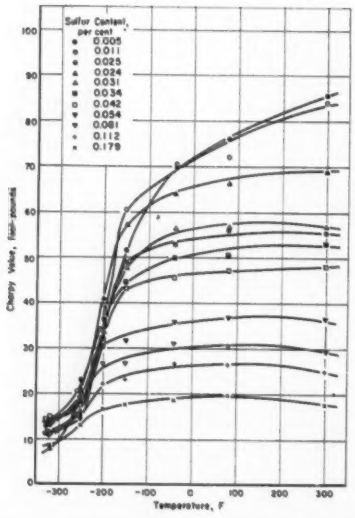
United States Steel Corp.
R. H. FRAZIER
Research Supervisor
Youngstown Sheet & Tube
F. W. BOULGER
Chief, Div. of Ferrous Metallurgy
Battelle Memorial Institute

THE EFFECT OF SULFUR ON THE NOTCH TOUGHNESS OF HEAT TREATED STEELS—an abstract

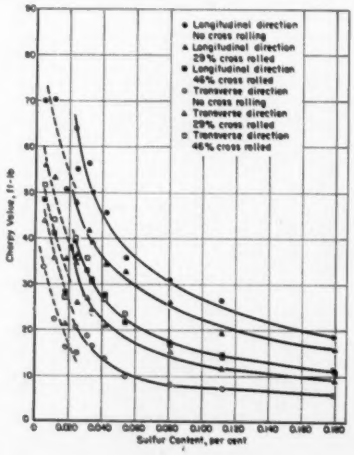
The following is an abstract of a paper prepared by the authors presented before a joint AIME-ASM Meeting. Only the conclusions and the charts which led to these conclusions are presented as of fundamental interest to the readers of METAL TREATING.

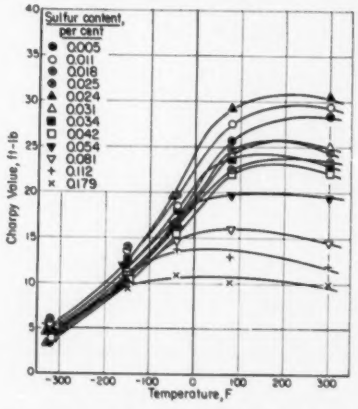
Although it has been generally recognized, that for applications in which notch toughness is critical, the sulfur content of the steels used should be held to a low value, quantitative information on the effect of sulfur on notch toughness has not been available. For such applications, it is a common practice to specify minimum impact values, and in order that these may be met consistently it is important that the steel producer know quantitatively the effect of sulfur on notch toughness so that realistic sulfur content limits can be applied to the steels they produce. In many instances, particularly in flat-rolled products, impact properties are specified in the direction transverse to the principal rolling direction, so that the factors affecting the anisotropy or directionality of impact properties are also of concern to the steel producer. For some applications, furthermore, it is a common practice to increase the sulfur content of steels in order to improve their machinability, and, in such instances, the effect of this practice on notch toughness may often be of concern. This paper reports on an investigation, carried out at Battelle Memorial Institute, designed to furnish this quantitative information on the effect of sulfur on notch toughness and also to furnish further information on the factors affecting the anisotropy of impact properties in wrought heat-treated alloy steels.



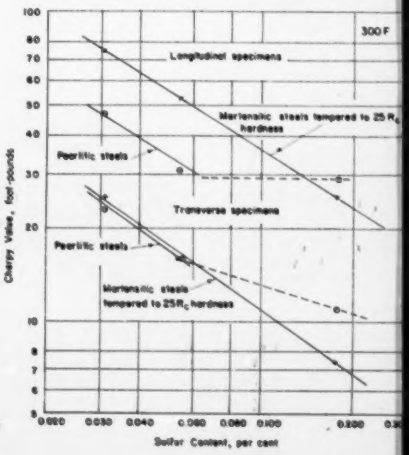
Transition curves for longitudinal specimens from ½ in. plate, no cross rolling and heat treated to Rc hardness.

Effect of sulfur content on V-notch Charpy value of ½ in. plate heat treated to 30 Rc hardness and tested at -40 F.

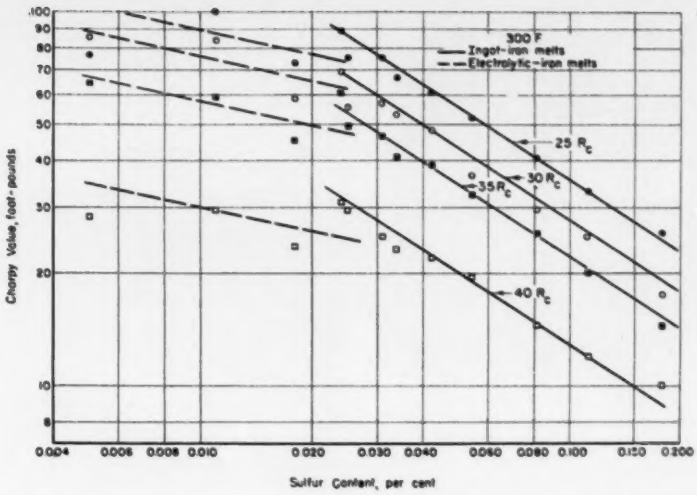

Longitudinal direction no cross rolling
Longitudinal direction 29% cross rolled
Longitudinal direction 46% cross rolled
Transverse direction no cross rolling
Transverse direction 29% cross rolled
Transverse direction 46% cross rolled
Charpy Value, ft-lb
Sulfur Content, per cent



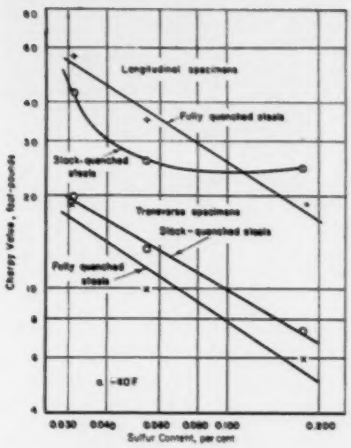
Transition curves for longitudinal specimens from ½ in. plate rolled with no cross rolling and heat treated to 40 Rc hardness.



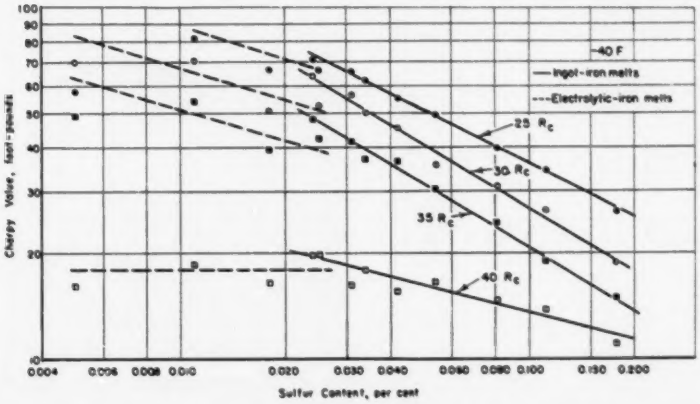
Influence of sulfur content on V-notch Charpy values of pearlitic and tempered martensitic steels when tested at 300 F.



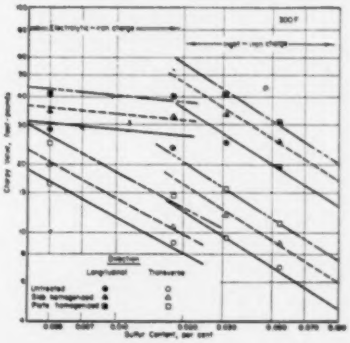
Effect of sulfur content on V-notch Charpy values of longitudinal specimens from straight rolled 0.5 in. plate heat treated to various hardnesses and tested at 300 F.



Influence of sulfur content on V-notch Charpy values for fully quenched steels at -40 F. and 300 F. All specimens heat treated to 30 Rc.



Effect of sulfur content on V-notch Charpy values of longitudinal specimens from straight-rolled 0.5 in. plate heat treated to various hardnesses and tested at -40 F.



Effect of sulfur on the V-notch Charpy values at 300 F. of straight rolled 0.5 in. plate in three conditions of homogenization. All specimens heat treated to 40 Rc.

CONCLUSIONS

The results of the investigation described above lead to the following conclusions:

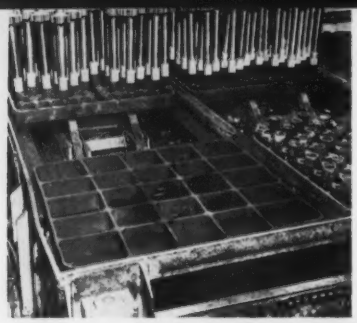
1. Increasing sulfur content in an alloy steel of base composition 0.3 C-2.5 Ni-0.8 Cr-0.45 Mo decreases Charpy V-notch impact resistance in a regular manner at hardness levels in the rage Rc 25 to 40, for both straight and cross-rolled conditions. Charpy values for these steels, plot as straight lines vs. sulfur content, on logarithmic coordinates.

2. Sulfur content did not markedly affect the Charpy impact transition temperature of these steels, although there was a trend toward a moderate decrease in transition temperature with increasing sulfur content.

3. Directionality in plates of the steel studied depends on rolling practice and not on sulfur content. Cross rolling decreases the spread in Charpy values between longitudinal and transverse specimens proportional to its amount and independent of sulfur content.

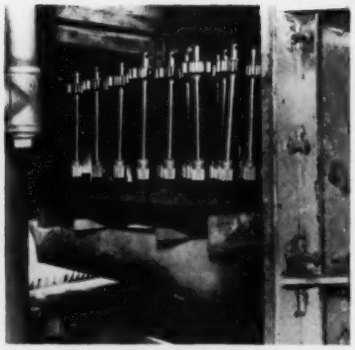
4. The effect of sulfur on impact properties is similar in steels with pearlitic or slack-quenched microstructures to that in steels with tempered martensitic microstructures, for steels with sulfur contents of 0.060 pct or below.

5. Notched-bar impact values are improved by an homogenization treatment of 10 hr. at 2350 F., independent of sulfur content, but directionality of properties is relatively unaffected. This treatment results in a rounding of sulfide inclusions, which is believed to be the principal factor in the improved impact properties. ● ● ●



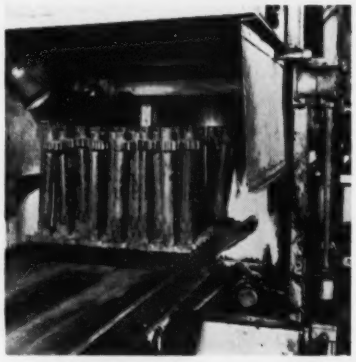
Trays for loading fixtures with Ford steering gear parts are shown unloaded in foreground, with loaded fixtures and gear parts in background. First made of cast metal, trays were unable to withstand extreme thermal shock encountered in carburizing and hardening operations and breakdowns were frequent. Trays currently used at Ford's Indianapolis, Indiana plant, are manufactured by Wiretex Manufacturing Company, Inc., are fabricated from Type 330 alloy bars, have gone more than 22 months in continuous service.

Gear parts are loaded on parts holding fixture prior to entry into furnace. The entire cycle takes about 12 hours and includes oil quench after two high temperature stages. Tray holds fixture and gear parts, about 252 pounds of weight, throughout the entire cycle.



Fully loaded alloy tray with gear parts is shown being placed in pusher type furnace. Parts are carburized at 1670 F., are dropped to 1540 F. and are then immersed in oil bath.

USE OF ALLOY PALLETS LENGTHENS BASE TRAY LIFE IN FORD HEAT-TREATING CYCLE



Tray emerges from furnace after oil bath. Severe thermal shock encountered during oil quench was a factor which induced the breakdown of cast metal trays. Similar units, fabricated from Type 330 alloy bars by Wiretex Manufacturing Co., Inc., Bridgeport, Conn., have been in continuous use for the past 26 months.

Heat Treating Case Histories — Case No. 3

BASE TRAYS made of Type 330 alloy bars have appreciably lengthened the service life of such equipment used by the heat treating department of the Steering Gear and Cold Heading Plant, Ford Motor Company, Indianapolis, Indiana.

Steering gear parts are carburized and hardened in a pusher type gas carburizing furnace. A special parts-holding fixture which holds the gear parts in a vertical position is mounted on the tray. When loaded, the 42 lb. base tray supports a 252 lb. load which is pushed into a furnace chamber maintained at 1670 F. After the carburizing process, the pallet is moved into a soaking zone at 1540 F. When carburizing is completed, the parts are quenched in controlled temperature oil. The entire cycle lasts about 12 hours, during which the pallet is in continuous use, permitting the handling of a wide variety of parts and heat treatments.

Initially, cast pallets were used. The extreme thermal shock, occasioned during the oil immersion caused a high percentage of breakup among the cast trays. The constant replacement of equipment costing approximately $55. per tray caused heat treat engineers to seek a more economical substitute.

A Wiretex built base tray, manufactured by Wiretex Manufacturing Company, Inc., Bridgeport, Connecticut, 20 in. x 22 in., fabricated from Type 330 alloy bars 1¾ in. by ¼ in. on edge, was substituted.

After preliminary tests proved satisfactory, a number of units were purchased for further trial. After 26 months, the original consignment is still in operation with minor distortion and only hairline cracks in the welds. Cast trays placed into operation at the same time, have had to be replaced. In fact the Wiretex Base Tray equalled the life of three cast trays. • • •

CINCINNATI®
Advanced Heat Engineering
Travels to the job

Shown above is another example of CINCINNATI ADVANCED HEAT ENGINEERING . . . a new Inductron® 400 cycle, 30KW, Motor Generator Heating-Stress Relieving Machine. This unit is being used for the preheating and stress relieving of welded piping. Designed to be transported from one job site to another, heating can be accomplished up to 200 feet away from the generator—in otherwise inaccessible places —using small diameter cables and wrap-around or clamp-on coils. The heating cycle is automatically programmed.

As builders of a complete line of Flamatic® flame heating and Inductron motor generator and radio frequency induction heating machines, CINCINNATI is ready to serve you with detailed engineering calculations and the selection of tooling and heating equipment to solve your heat processing needs. Let the benefits of CINCINNATI ADVANCED HEAT ENGINEERING work for you. Call in a Meta-Dynamics Division field engineer.

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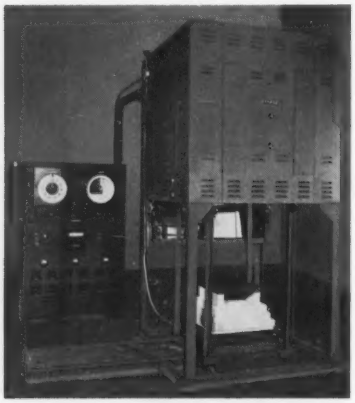
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio, U.S.A.
CINCINNATI

NEWS TO HEAT TREATERS...

New Harrop Models

Plus or minus two degree accuracy up to 2700 F. is said to be available from this Harrop nonmetallic resistor electric furnace. The unit is available from Harrop Precision Furnace Company, Columbus, Ohio.



Firing is rapidly accomplished into the 2000 to 2700 F. range, and cooling can be quickly accomplished by an external sealed heat exchanger to follow a program controller. Elevator operation can be either mechanical or hydraulic. This type of atmosphere furnace is adaptable to numerous uses, such as crystal growing and firing of ferrites, titanates and similar electronic ceramic parts.

Pictured here is model NMR-20E, with a setting space 20 in. by 26 in. by 20 in.; model NMR-12E has a setting space 12 in. by 16 in. by 12 in. Both models are available sealed for atmosphere operation.

For further information circle No. 8

Brew Model 300

A new high temperature vacuum furnace featuring what is believed to be the smallest hot zone in commercial equipment is being offered to university, government and industrial metal research laboratories by the Vacuum Furnace Division of Richard D. Brew & Company, Inc.

The Brew Model 300 furnace is a resistance type unit that will perform such operations as sintering, brazing, bright annealing and melting at vacuum pressures of 0.1 to 0.05 micron Hg at uniform temperatures up to 2500 C. (4532 F.). Only 5 kilowatts of power are required for continuous operation at the maximum temperature.

The unusually small hot zone, measuring 1 in. by 3 in., makes the Model 300 ideal for use in metal research labs where operations do not require the larger hot zones provided in presently available high temperature vacuum furnaces. Up to now, metal research laboratories with requirements for high temperature vacuum furnaces have had to use equipment to satisfy the volume production requirements of industry. Other advantages the Model 300 furnace offers to the metal researcher are initial cost considerably lower than the much larger industrial production type units and a lower operating cost because of the low power requirement.

The most important component in the new furnace is a special tantalum heating element assembly designed by Brew engineers. The unique construction of this element makes it completely distortion resistant, resulting in far greater element life than can be expected from any other sheet type element in use today. Another advantage of the special element is that all of its heating surfaces are continually at the same temperature, insuring temperature uniformity of the work piece. A third advantage is that thermal losses caused by radiation and conduction are reduced, thereby conserving input power.

The Model 300 is a compact console unit 30 in. wide, 30 in. long and 35 in. high. All operating controls are located at the front for operator convenience. The vacuum furnace chamber is formed by a pyrex bell jar that fits over the furnace baseplate. When the bell jar is removed, the work sample and heating element are readily accessible.

For further information circle No. 14

MTI Election Results

Highlighting the Annual Business Meeting of the Metal Treating Institute held at the Sheraton Dallas Hotel, Dallas, last October was the election of Officers and the Board of Directors for 1961.

J. H. Ries, Lakeside Steel Improvement Company, Cleveland was elected president of the organization. He succeeds C. R. Weir, Commonwealth Industries, Inc., Detroit.

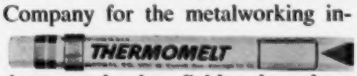
C. F. Dominy, Superior Heat Treating Company, Fort Worth, was elected vice president and Lloyd G. Field, Greenman Steel Treating Company, Worcester, Massachusetts, was re-elected treasurer.

Board of Trustee posts were voted to the following: J. R. Gier, Ferrotherm Company, Cleveland; L. J. Haga, State Heat Treat, Inc., Grand Rapids, Michigan; T. H. MacIndoe, Vincent Steel Process, Detroit; H. L. Miller, Benedict-Miller, Inc., Lyndhurst, New Jersey; B. F. Rassieur, Paulo Products Company, St. Louis; and G. C. Underwood, New England Metallurgical Corp., South Boston.

The position of Ex Officio was awarded to former MTI president Weir.

Markal Introduces Thermomelt Indicators

Thermomelt is the name of a new product line developed by Markal Company for the metalworking in-



dustry and other fields where heat is used.

Markal's Thermomelt is a precision temperature indicator designed to tell metallurgist, engineer and metalworker when a surface has reached a specific temperature. Available in stick, pellet and liquid form, Thermomelt is provided in a wide choice of Fahrenheit ratings from 113 to 2000 F. which, according to the manufacturer, will cover all requirements in the heat-treating and heat processing fields.

Use of Thermomelt is claimed by the manufacturer to be simplicity itself. The metal surface is marked with the stick or liquid or a pellet is placed on the surface. When the surface reaches the wanted temperature, the Thermomelt mark—or pellet quickly liquefies.

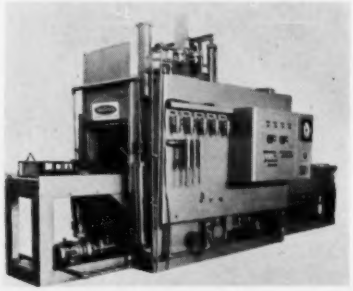
The Thermomelt stick comes in a metal holder which enables the user to dispense the stick as needed and also prevents breakage and loss of part of the stick. The liquid is packaged in a glass bottle with a brush dispenser in the cap, while the pellets are packaged 20 to a plastic tube.

For further information circle No. 9

New Sunbeam Casemaster

A new automatic furnace, called the Casemaster, has been introduced by Sunbeam Equipment Corporation, Meadville, Pennsylvania.

The furnace is atmosphere controlled and is equally effective as a multipurpose furnace in a heat treating department or for processing in a continuous production line. It can be used for carburizing, carbonitriding, carbon restoration, normalizing, annealing and hardening up to 1850 F.



The unit can be built with work space dimensions up to 32 in. wide by 50 in. long by 26 in. high. It can accommodate up to 1,500 pounds of work in any one load. Bearings, instrument parts, tubes, gears, bushings, shafts, hinge pins, bolts, nuts, chains, screws and fasteners are typical of the large and small parts that may be heat treated.

Automatic operation speeds up loading of the furnace while automatic controls minimize human error. The unit's flexibility permits processing of a wide variety of operations and time cycles over a broad temperature range. No moving parts of the work transfer system are exposed to excessive heat in the furnace.

The Casemaster furnace is normally supplied with an integral oil quench tank and a completely prewired control panel. All equipment is wired, piped and pretested before shipment.

For further information circle No. 15

Niagara Exhibits at National Power Show

Niagara Blower Company exhibited at the National Power Show November 28—December 2, at the New York Coliseum, Booth 655. The exhibit consisted of the company's industrial air conditioning and heat transfer apparatus.

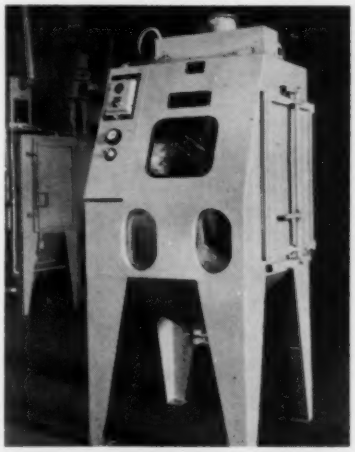
Especially featured, with full scale equipment on display, was the Niagara Aero Heat Exchanger, used in many varied industrial processes for cooling liquids or gases, in a closed system, transferring the heat to the atmosphere at the rate of input by evaporating a water spray over cooling coils, modulating the capacity to the load. Also included were models of the company's Hygrol air conditioning units, Niagara aero after coolers for compressed air and air and gas separation systems, including oxygen plants, and Niagara aero condensers.

A special, operating exhibit showed the Niagara "No-Frost" refrigerating method in a unit with a thermopane front panel making visible the accumulation of frost in a conventional dry coil cooler while on the other side of a dividing partition the "No-Frost" spray method kept the coils clean and maintained the full capacity of the unit.

For further information circle No. 28

Wet Blasting Units

Wet blasting is being used more and more to improve surface finish and fatigue life of metal parts. For this reason, Metal Improvement Company has introduced some new models designed specifically for this operation.



Peenamtic Model 826, shown here, developed through years of shop experience in glass peening and wet blasting, offers design features which are of special interest to the user. This model is being offered either with purely pneumatic action for greatest simplicity or with a motorized pump for greater output. The packless pump has a special wear plate which prolongs the service life of the unit. Both the impeller and the special wear plate are quickly and easily replaced at moderate cost. Downtime is said to be virtually eliminated.

Features include window washer, movable gun mount, removable hatch for blasting of long parts, high capacity exhaust fan and filter, and instant slurry change. The equipment is fully warranted for one year.

For further information circle No. 11

NEWS TO HEAT TREATERS

Stokes Laboratory Facililties Available

Metal working firms that would like to explore the applicability of vacuum heat treating, brazing, or high temperature sintering, or precision casting to their production processes before making a commitment for capital investment will now be able to do so at nominal cost. Special laboratory facilities have been established by the Vacuum Metallurgical Department of F. J. Stokes Corporation, Philadelphia, for this express purpose.

Universities conducting research in solid state physics or the properties of high temperature metals and ceramics can also use the Stokes facilities for some of their experimental work.

The facilities, which are being made available at a modest scale of laboratory service fees, include: a Stokes Model 435-582 cold wall vacuum heat treating furnace, designed to operate at temperatures up to 2200 C. and with a hot zone 3½ in. in diameter and 6½ in. deep, ample size to accommodate most pilot-scale sample test runs; a Stokes Model 437-520 precision casting vacuum furnace, with an ultimate capacity of 17 pounds; and a Stokes Model 435-522 vacuum heat treating furnace, where temperatures up to 1850 F. can be maintained within a uniform temperature zone 10 in. in diameter and 10 in. high.

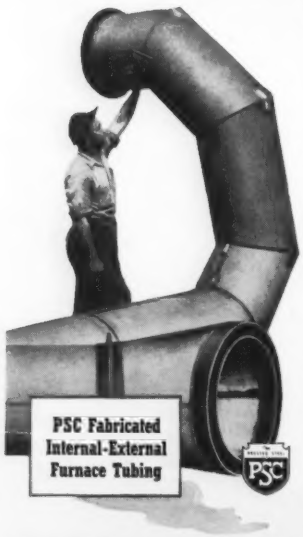
These three standard design Stokes vacuum furnaces supplement pilot-scale equipment in the Stokes laboratories for experimental evaluation of vacuum metallizing techniques, vacuum drying cycles, and powder metal pressing.

Shown here is a laboratory technician loading a charge of metal components into the chamber of a Model 435-582 furnace.

For further information circle No. 16

for critical corrosive or heat conditions

SPECIFY 'PSC' PROCESS PIPING



You will find PSC offers you this very real advantage in solving heat and corrosion problems. Being independent of all metal producers, we regularly fabricate the complete list of alloys. As a result, when ordering welded tubing from PSC you can choose, from the complete list, the one alloy which will best meet your specific heat or corrosion condition. In contrast, seamless tubing is only available in certain alloys. From PSC you can also order tubing in any wall thickness. In many cases process piping can be lighter than I.P.S. standard. In some, only a light-wall type of construction is practicable. In any case, why pay for heavy wall sections if PSC tubing of money-saving light gauges will serve as well? Also tubing in any diameter or shape. Let us give you details as to how PSC process piping can help solve your problems.

THE PRESSED STEEL COMPANY
of WILKES-BARRE, PENNSYLVANIA

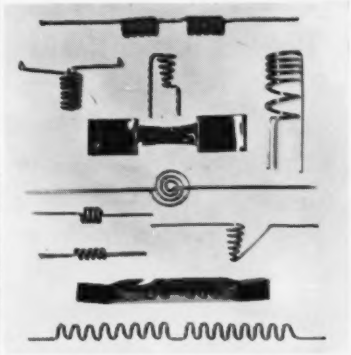
Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆

For further information circle No. 45

Filaments and Boats

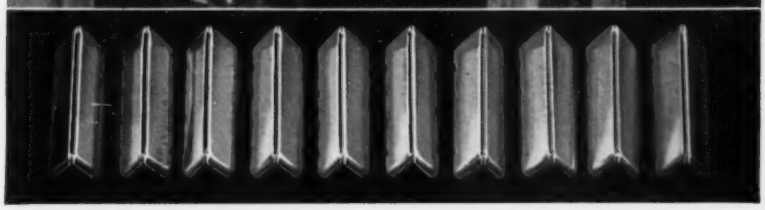
A new complete line of tungsten, tantalum and molybdenum filaments, and boats are now available in a variety of sizes and shapes.



Manufactured for use in high vacuum as an evaporation source, these filaments and boats are processed

Continued on page 22

Tool Steel Topics



Lehigh H blanks and forms 1,000,000 pieces before redressing is necessary

Using a die of Bethlehem Lehigh H tool steel, Sobel Metal Products Co., Easton, Pa., produced this nickel-silver belt accessory, of the type used with army uniforms, at the rate of about 1,000,000 pieces before redressing was necessary. Blanking and forming .020-in. metal, the die was hardened to Rockwell C60-61. One of the requirements of the order was that no marking was permitted on the finished part.

Lehigh H (AISI D-2) is excellent tool steel for jobs like this. Not only is it the leader in machinability among the high-carbon, high-chromium tool steels sold today — it also has improved wear-resistance because its vanadium content has been increased to 1 pct.

As the result of a new manufacturing process, Lehigh H has improved carbide distribution and increased center density. It also has minimum distortion during heat-treatment.

If you want unexcelled machinability, excellent wear-resistance, and plenty of dependability, Lehigh H is your answer. See your Bethlehem tool steel distributor for prompt delivery.

For further information circle No. 46

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Blind Holes Can Cause Plenty of Trouble

Unless one uses great care, blind holes can cause a lot of trouble when heat-treating tools. Holes for studs or dowel pins are typical of the blind holes which, as a rule, are paid little attention. Exposing blind holes to liquid quenching produces extremely high internal stresses, which can lead to cracking of the tool, either during heat-treatment or in service.

If it is not necessary for blind holes to be hard internally, these difficulties can be avoided by packing the holes prior to the quench, using clay, asbestos rope, steel wool, or a steel plug.

Blind holes are particularly objectionable if they must be uniformly hard on the inside surface. The only way to meet this requirement consistently is to select a grade of air-hardening tool steel.

Be Sure to Try Red Sabre Tool Bits

You're sure of economical cutting when you use Bethlehem Red Sabre Tool Bits, regardless of the type of application. Red Sabre is a super high-speed steel, with about 1.50 carbon, 12.00 tungsten, 5.00 vanadium, and 5.00 cobalt. The bits have high red-hardness and uniform hardness all the way through, for peak resistance to wear and maximum cutting ability. They come hardened to Rockwell C65.

NEWS TO HEAT TREATERS

Continued from page 20

to maintain a new high standard of purity and accuracy. All parts are stress relieved to obtain the longest possible life in operation, and to maintain their geometry during use.

Primary uses for these filaments and boats include: electronic component processing, coating of optics, plastics and toy decorative coating, precision instrumentation manufacturing, and vacuum metalizing in basic research laboratories.

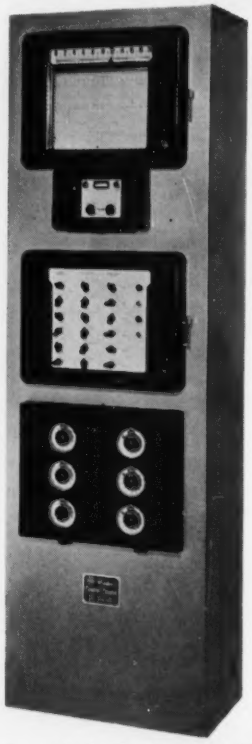
For further information circle No. 31

Universal Programmer

The Wheelco Instruments Division of Barber-Colman Company has introduced what company officials call one of the most flexible of program units available to industry.

The unit was originally designed for the metallurgical research field in connection with the processing of many of our new and sophisticated metals. Flexibility of the new programmer makes it a desirable unit for the solution of both research and production process programs encountered in other industrial areas.

Typical programs, which might include three time temperature rises, and three soak periods, as well as two temperature rises, one fall, and



a soak period along with all the combinations which can be achieved by the use of index switches, timers and input controllers, are all finger tip controlled. All units which make up the new programmer are prewired and assembled into a convenient sized panel.

A Wheelco 8000 Series Electronic Recorder Controller provides a complete recorder of each program. Magnetic modulated, three function control forms add further flexibility to the overall programmer.

For further information circle No. 10

Vulcan Duct Heaters

New Vulcan high temperature duct heaters designed for heating air or gases under conditions of high pressures, high velocities and high temperatures are now available. The units are recommended for direct heating or air process heating in large scale drying operations encountered in nuclear power plants,

ROLOCK®

FABRICATED HEAT AND CORROSION RESISTANT ALLOYS

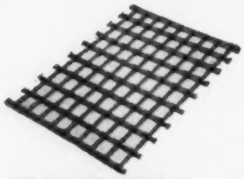
ROLOCK "ORIGINALS" help heat treaters reduce costs

Rolock has done more, we believe, than anyone else in the field to *originate* improved design and construction features that have consistent practical value to the heat treater.

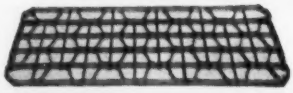
Well-known examples are the Rolock patented design automatic pusher furnace trays; Rolock Serpentine construction, applicable to a wide range of flat- and basket-type tray designs; Rolock double- and triple-layer pressure welding applied to grids and trays; Rolock *Corrugated* construction of baskets and muffles. There are also many other detail advances that were pioneered by our engineering department.

These improvements have resulted in longer furnace-life expectancy . . . often with a far more efficient load-to-weight ratio . . . superior heat transfer and overall performance . . . all key factors in making money while maintaining the quality of your work.

Are you enjoying these very real competitive advantages? We'll welcome an opportunity to quote on your current needs.



"PRESSURE WELDED" Furnished 2-layer or 3-layer



"SERPENTINE"

"PRESSURE WELDED" with pusher pads

"SERPENTINE" with load-retaining sides

SALES AND SERVICE REPRESENTATIVES FROM COAST TO COAST

ROLOCK INC., 1332 KINGS HIGHWAY, FAIRFIELD, CONN.

JOB-ENGINEERED for better work
Easier Operation, Lower Cost

SRL60B

For further information circle No. 47

wind tunnels, industrial ovens, and many similar uses.

The heaters are constructed of highly compressed alloy sheath tubular elements mounted in a steel flange, complete with mounting holes for attaching to duct assemblies. NEMA class terminal boxes are supplied to meet specific applications.

For further information circle No. 32

Precision Controller

Controlling the temperature of electrically heated materials by smoothly and precisely regulating input power is the function of Model SPY 5064 Thermac developed by Research, Inc. The unit operates by continuously proportioning the output of two air cooled thyratrons from 3% to 95% of their rated power. Typical applications available through this method are the controlling of furnaces and ovens used in heat treating, enameling, baking, drying, curing, glass smelters and laboratory tests.

Thermac uses for its control reference either a manually adjustable, temperature calibrated, set

point potentiometer, or a voltage from a remote programmer or computer. This control reference is compared in a precision circuit with the feed back signal from a thermocouple or radiation pyrometer. Any difference is an error signal which results in corresponding readjustment of controller output.

Adjustments are provided for limiting the rate of temperature rise and for adjusting proportional band width. Thermocouple cold junction temperature compensation, thermocouple fail safe, and interchangeable temperature range cards are standard features.

For further information circle No. 31

Continued on page 28

The first

BRIGHTNESS PYROMETER

which is fully

AUTOMATIC *and* CONTINUOUS

PYRO-650*

for temperature measurement, recording and control in the ranges from 1100°F to 7200°F and 600°C to 4000°C.

Brightness pyrometers are widely used for non-contacting, high temperature measurements. However, because existing devices are manually operated, their use has been limited to intermittent temperature measurements of short duration.

Now, PYRO-650 provides the accuracy and repeatability of a Brightness Pyrometer in a fully automatic instrument which is ruggedly designed for continuous temperature measurement, recording and control in plant environments as well as laboratory applications.

IDL also manufactures PYRO-EYE*, a two-color optical pyrometer which offers special advantages for some types of application.

*Trade Mark of Instrument Development Laboratories, Inc.

For complete information write for brochure.

IDL

INSTRUMENT DEVELOPMENT LABORATORIES, INC.

Subsidiary of ROYAL McBEE

67 MECHANIC STREET, ATTLEBORO, MASS., U. S. A.

For further information circle No. 48

HAVE YOU A HEAT TREATING PROBLEM?

Take it to your Commercial Heat Treater for:

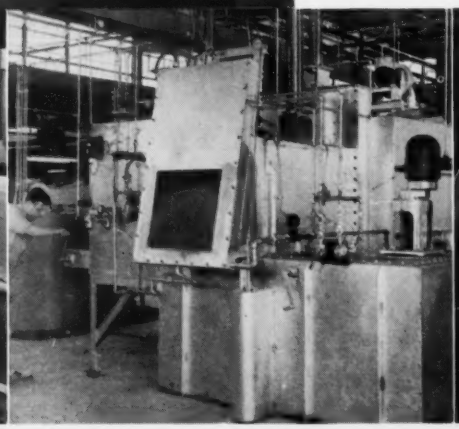
DESIGN: Technical advice about the *design* of me parts requiring heat treating.

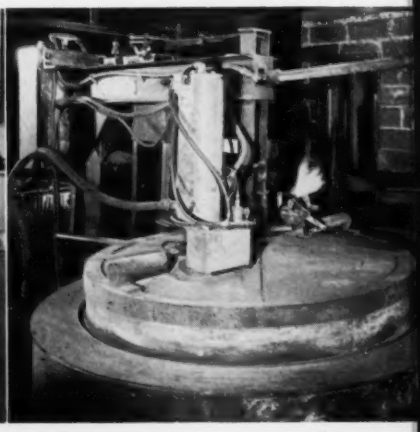
PROCESS: Facts as to the correct heat treati *process* required to achieve service requirements.

EQUIPMENT: The variety of modern specializ *equipment* needed for efficient cost saving oper tions.

SKILLS: The operational *skills* developed by years experience in all phases of ferrous and non-ferro metal treatments.

All these add up to SERVICE –the type of service only the Commercial Heat Treater can provide.





THERE'S A HEAT TREATING SPECIALIST NEAR YOUR PLANT

ALABAMA

Southern Metal Treating Co., Inc.
3131 10th Ave. N., Birmingham 4

CALIFORNIA

Downey Steel Treating Co., Inc.
9637 Nance St., Downey
National Heat Treating Co., Inc.
1833 W. Florence, Inglewood 1
Certified Steel Treating Co.
2454 E. 58th St., Los Angeles 58
Lindberg Steel Treating Co.
2910 S. Sunol Drive, Los Angeles 23
Cook Induction Heating Co.
4925 East Slauson Ave., Maywood

CONNECTICUT

Commercial Metal Treating, Inc.
89 Island Brook Ave., Bridgeport 6
Stanley P. Rockwell Co.
296 Homestead Ave., Hartford 12
Ireland Heat Treating Co.
512 Boston Post Road, Orange

ILLINOIS

Accurate Steel Treating Co.
2226 W. Hubbard St., Chicago 12
Allied Metal Treating Corp. of Illinois
333 N. California Ave., Chicago 12
Dura-Hard Steel Treating Co.
2112 W. Rice Street, Chicago 22
Perfection Tool & Metal Heat Treating Co.
1756 West Hubbard St., Chicago 22
Fred A. Snow Co.
1942 West Kinzie St., Chicago 22
American Steel Treating Co.
P. O. Box 396, Crystal Lake
Lindberg Steel Treating Co.
1975 N. Ruby St., Melrose Park
Eklund Metal Treating, Inc.
721 Beacon St., Rockford
Scott Ford, Inc.
2719 Fifth St., Rock Island
Ipsenlab of Rockford, Inc.
2125 Kishwaukee Street, Rockford
O. T. Muehlemeyer Heat Treating Co.
1500 Preston St., Rockford

INDIANA

Quality Steel Treating Company
1630 Locust Street, Anderson
Industrial Heat Treating & Metallurgical Co., Inc.
2131 Northwestern Ave., Indianapolis 2

MASSACHUSETTS

Kinetics Corporation, a Division of High Vacuum Equipment Corp.
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Porter Forge & Furnace, Inc.
74 Foley St., Somerville 43
New England Metallurgical Corp.
475 Dorchester Ave., South Boston 27
Springfield Heat Treating Corp.
99 Margaret Street, Springfield
Greenman Steel Treating Co.
284 Grove St., Worcester 5

MICHIGAN

Anderson Steel Treating Co.
1033 Mt. Elliot Avenue, Detroit 7
Bosworth Steel Treating Co.
18174 West Chicago Blvd., Detroit 28
Commercial Steel Treating Corp.
6100 Tireman Ave., Detroit 4
Commonwealth Industries, Inc.
5922 Commonwealth Ave., Detroit 8
Vincent Steel Process
2424 Bellevue Ave., Detroit 7
State Heat Treat, Inc.
520 32nd Street, S. E., Grand Rapids 8
Royal Oak Heat Treat, Inc.
21419 Dequindre, Hazel Park

MISSOURI

Lindberg Steel Treating Co.
650 East Taylor Ave., St. Louis 15
Paulo Products Co.
5711 West Park Ave., St. Louis 10

NEW JERSEY

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790 Washington Avenue, Carlstadt
American Metal Treatment Co.
Spring and Lafayette Sts., Elizabeth
Benedict-Miller, Inc.
Marin Ave. & Orient Way, Lyndhurst
Bennett Heat Treating Co., Inc.
246 Raymond Boulevard, Newark 5
L-R Metal Treating Corp.
107 Vesey St., Newark 5
Temperature Processing Co., Inc.
228 River Road, North Arlington

NEW YORK

Owego Heat Treat, Inc.
Rural Route 1, Apalachin
Eastern Heat Treating & Brazing Corp.
44 Sea Cliff Avenue, Glen Cove
Alfred Heller Heat Treating Co., Inc.
391 Pearl St., New York 38
Lindberg Steel Treating Co.
620 Buffalo Road, Rochester 11
Rochester Steel Treating Works
962 Main Street, E. Rochester 5
Syracuse Heat Treating Corp.
1223 Burnet Ave., Syracuse 3

OHIO

Queen City Steel Treating Co.
2980 Spring Grove Ave., Cincinnati 11
Ferrotherm Co.
1861 E. 65th St., Cleveland 3
Lakeside Steel Improvement Co.
5418 Lakeside Ave., Cleveland 14
The Modern Steel Treating Co.
5466 Lake Court, Cleveland 14
George H. Porter Steel Treating Co.
1273 East 55th Street, Cleveland 3

OHIO — (Cont'd)

Reliable Metallurgical Service, Inc.
3827 Lakeside Ave., Cleveland 14
Winton Heat Treating Co.
20003 Lake Road, Cleveland 16
Dayton Forging & Heat Treating Co.
2323 East First St., Dayton 3
Ohio Heat Treating Co.
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PENNSYLVANIA

Drever Company
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Lorenz & Son
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Metlab Company
1000 E. Mermaid Lane, Philadelphia 18
Pittsburgh Commercial Heat Treating Co.
49th St., and A.V.R.R., Pittsburgh 1
Pittsburgh Metal Processing Co., Inc.
1850 Chapman Street, Pittsburgh 15

TENNESSEE

Mid-South Metal Treating Co.
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TEXAS

Dominy Heat Treating Corp.
P. O. Box 5054, Dallas
Superior Heat Treating Co., Inc.
P. O. Box 69, Fort Worth 1
United Heat Treating Company
2005 Montgomery Street, Fort Worth 7
Cook Heat Treating Co., of Texas
6233 Navigation Boulevard, Houston 11
Houston Heat Treating Company, Inc.
2100 Quitman Street, Houston 26
Lone Star Heat Treating Corp.
5212 Clinton Dr., Houston 20

WISCONSIN

Allied Metal Treating Corp.
P. O. Box 612, Milwaukee 1
Heat Treating Engineers, Inc.
1146 North 54th St., Milwaukee 8
Metal Treating, Inc.
720 South 16th St., Milwaukee 4
Supreme Metal Treating Co.
4440 West Mitchell St., Milwaukee 14
Thurner Heat Treating Co.
809 West National Ave., Milwaukee 4
Wisconsin Steel Treating & Blasting Co.
1114 South 41st Street, Milwaukee 15
Harris Metals Treating Co.
4100 Douglas Ave., Racine

All of the above listed firms are members of the

METAL TREATING INSTITUTE

For Further Information Contact

METAL TREATING MAGAZINE

900 North Federal Highway Pompano Beach, Florida

About People.....

Wesley R. Gilbert 1897-1960

Wesley R. Gilbert, 63, Chief Engineer of C. I. Hayes, Inc. of Cranston, Rhode Island since 1929, died September 29 after a long illness.

Wesley R. Gilbert

Mr. Gilbert was widely noted for his contributions to the mechanical and electrical design — many of them patented — of industrial electric furnaces which the Cranston firm manufactures. He was an electrical engineering graduate of Tufts University and took advanced engineering studies at the Massachusetts Institute of Technology.

Prior to his association with C. I. Hayes, Mr. Gilbert worked for several years designing diesel locomotives and electric furnaces for General Electric Company in Lynn, Massachusetts.

Mr. Gilbert was a member of the American Society for Metals, Rhode Island Chapter. He was also a member of the Monitor Lodge of Masons, Waltham, Massachusetts, and several other Masonic bodies, including the Commandery. He is survived by his wife, a daughter, and two grandchildren.

Ipsen Manager

Charles W. Brunstetter has been named manager of the Refractory Metals Division of Ipsen Industries, Inc. The refractory metals division has been created to develop methods for working molybdenum, super alloys and other special metals used for rockets and space vehicles.

Mr. Brunstetter was formerly vice president of Astrometals Corporation of Hawthorne, New Jersey, where he was engaged in the fabrication of experimental models of after burner sections for complex welded assemblies such as jet engines and ram jet components. He has carried out research and development projects with NASA in the use of refractory metals for space age requirements and was associated with Thermionic Products Company of Plainfield, New Jersey, in completing these projects. Prior to this, he was plant manager of Tolan Machine Company of Newark, New Jersey.

Mr. Brunstetter is a member of the American Society for Metals. He has written numerous articles concerning the properties of metals for space age requirements.

Branson Names Jacke New Power Division V-P

Stanley E. Jacke has been named Vice President in charge of Engineering and Research in the Power

Stanley E. Jacke

Division of Branson Instruments, Inc., Stamford, Connecticut. He was formerly president of Sonic Energy Corporation, Setauket, L. I., New York, an ultrasonic research firm which has been purchased and absorbed by Branson. The development of high intensity ultrasonic processing systems, initiated by Sonic Energy Corporation, will be continued and accelerated by Branson.

Jacke holds several patents for design of ultrasonic power transducers and processing equipment, and the past year has been president of the Ultrasonic Manufacturers Association, the industry's trade group.

Carpenter Announces Metallurgist Dept. Moves

Appointment of a metallurgist and the promotion of two men to assistant metallurgists has been announced by The Carpenter Steel Company, Reading, Pennsylvania.

John W. Keegan has been appointed metallurgist, hot and cold heading steels. He will assist in field service and development of cold heading business. Before joining Carpenter, Keegan was eastern sales manager for Herscott Corp., Rockford, Illinois. Earlier, he was employed by Ipsen Industries, Inc., and Camcar Screw & Manufacturing Corp., both of Rockford. He is a member of the American Society for Metals.

Andrew R. Walsh has been promoted to assistant metallurgist, high temperature alloys. Formerly in the mill metallurgy department, his new position will involve servicing and promoting of high temperature alloys. Prior to joining Carpenter last January, Walsh was employed by Wyman-Gordon Co., Worcester, Massachusetts, and Vacuum Metals Corp., Syracuse, New York. He is a member of the American Society for Metals.

Charles A. Divine, Jr., formerly on Carpenter's technical service department and stainless steel research and development staffs, was pro-

moted to assistant metallurgist, stainless steels. He will assist in servicing and developing new stainless steel business. Divine is a member of the American Society for Metals, the American Chemical Society, and the American Insittute of Mining and Metallurgical Engineers.

New Industry Member

Establishment of a new commercial metal treating firm in Cedar Rapids, Iowa, was recently announced by that city's Chamber of Commerce. The company was incorporated as Allied Metal Treating Corporation of Iowa. Commercial metal treating operations are expected to start by the first of the year.

"THERE'S ENTIRELY TOO MUCH HEAT LOSS FROM OUR FURNACES!"

The selection of Cedar Rapids, according to company president Charles I. Wesley, Jr., was the result of a recent survey of that city's existing industries which showed that there was a definite need for this type of service in the area.

Harper District Manager

The appointment of Robert Baldwin as district manager in the Pittsburgh, Pennsylvania, area for The H. M. Harper Company, Morton Grove, Illinois, has been announced by Earle A. Channer, vice president in charge of sales.

Prior to joining Harper Company, Baldwin served for more than 20 years as a member of the sales staff of the G. H. Tennant Company, Minneapolis, Minnesota.

Charles F. Brown Is New Loftus P. A.

The appointment of Charles F. Brown as purchasing agent for the Loftus Engineering Corporation has been announced by Walter Suydam, company president. Brown succeeds F. A. Rahter who has retired but will continue to serve the firm in a new capacity as consultant to the purchasing department.

Ruth Gaertner will continue in her position as assistant purchasing agent.

FREE the most valuable technical information ever prepared on FLAME HARDENING

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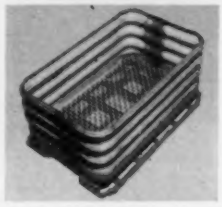
For further information circle No. 49

Custom FABRICATORS
DESIGNERS OF SPECIAL EQUIPMENT

High alloy such as RA-330, Hastelloy and Inconel—for the heat treating industries . . . a plant with over 50 years experience as fabricators, and grey iron castings. Illustrated above is Venturi-High Temperature Alloy.

Alloy muffle . . . example of one type fabrication job.

Corrugated baskets.



Pickling racks.

Fully illustrated colored brochure shows many types of Custom Fabrication . . . write for it today.

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Division of BERLIANA CORP.
BERLIN • WISCONSIN
For further information circle No. 50

NEWS TO HEAT TREATERS

Continued from page 23

Lucifer Furnace Markets Series 8012

Designated Series 8012, this electric heat treating furnace is the latest addition to the expanding Lucifer line. A combination space saver series, the 8012 is two furnaces in the floor space of one furnace.

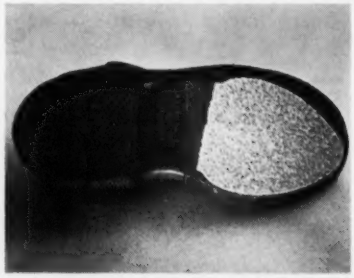
A complete heat treating application can be performed with this unit. Hardening in the high temperature furnace, drawing in the low temperature furnace, and quenching in the roll-away quench tank are one continuous operation.

The high temperature chamber operates to 2300 F. and the low temperature to 1250 F.

For further information circle No. 7

Shur-Tred Soles

Shur-Tred, a new adhesive backed safety sole is said to give positive footing on almost all surfaces. It is easily applied to any outdoor footwear. Made of the finest resinous abrasives, and with a



strong, self adhering back, Shur-Tred safely grips tilted or slippery floors, roofs, decks, steel work; eliminates slipping, skidding on wet, oil covered or icy surfaces.

A strong, self adhering back allows Shur-Treds to be easily applied in seconds. It is not affected by water, oil or gasoline. The sole will not conduct electricity, fits boots, rubbers, galoshes and most types of shoes.

For further information circle No. 30

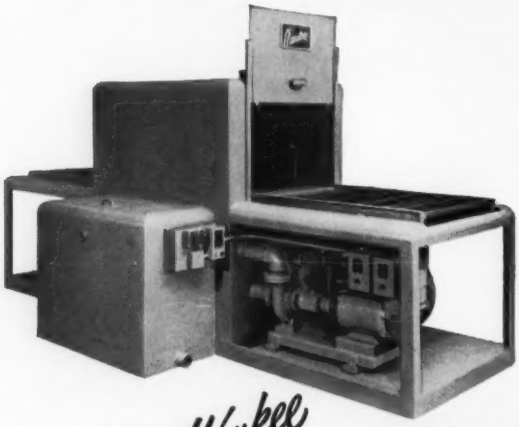
Labline Hi-Temp Oven Unveiled

A completely new laboratory oven, developed by Labline, Inc., Chicago, is said to make available the highest temperature—combined with vacuum—that is available.

Called the Super-Temp Duo-Vac Oven, the unit has a temperature range from room to 260 C. (500 F.) within an 11 in. by 12 in. deep stainless steel vacuum chamber.

Labline's new unit was designed

Continued on page 30



There's a standard Waukee® WASHER
TO MATCH YOUR CARBONITRIDER OR CARBURIZER!

Whatever the size of your carbonitrider or carburizer, the new Waukee Washer has a standard size to match it. Size range: 24 x 36 x 18 — 24 x 48 x 24 — 30 x 48 x 24 — 36 x 48 x 24.

COMPLETE — NO "EXTRAS" — Waukee parts washers come to you complete, ready to locate, connect to utilities, and begin operation. No "extras" to buy and install. Pumps, burners, controls are designed as integral parts of the Waukee Washer. You use your present furnace work-baskets, too.

FLEXIBILITY — You gain in flexibility with Waukee Washers. Standard units are available in "in-and-out" feed or straight-through, conveyor type, and in one, two, or three stages with rinse and dry. High-efficiency with gas, electricity, or steam.

THOROUGH CLEANING — The smallest Waukee Washer sprays a minimum of *one ton of hot detergent solution through the load each minute.* Solution penetrates work basket from top and bottom, washes away oil and foreign matter from the densest charge. Bull's-eye timer cycles the load for complete washing without guesswork or waste of time.

Complete data in Bulletin 1201 — write for it today.

Waukee-washed parts are free of cutting and quenching oils, mean clean furnace atmospheres, therefore predictable case depths and cleaner, brighter work.

Waukee ENGINEERING CO.

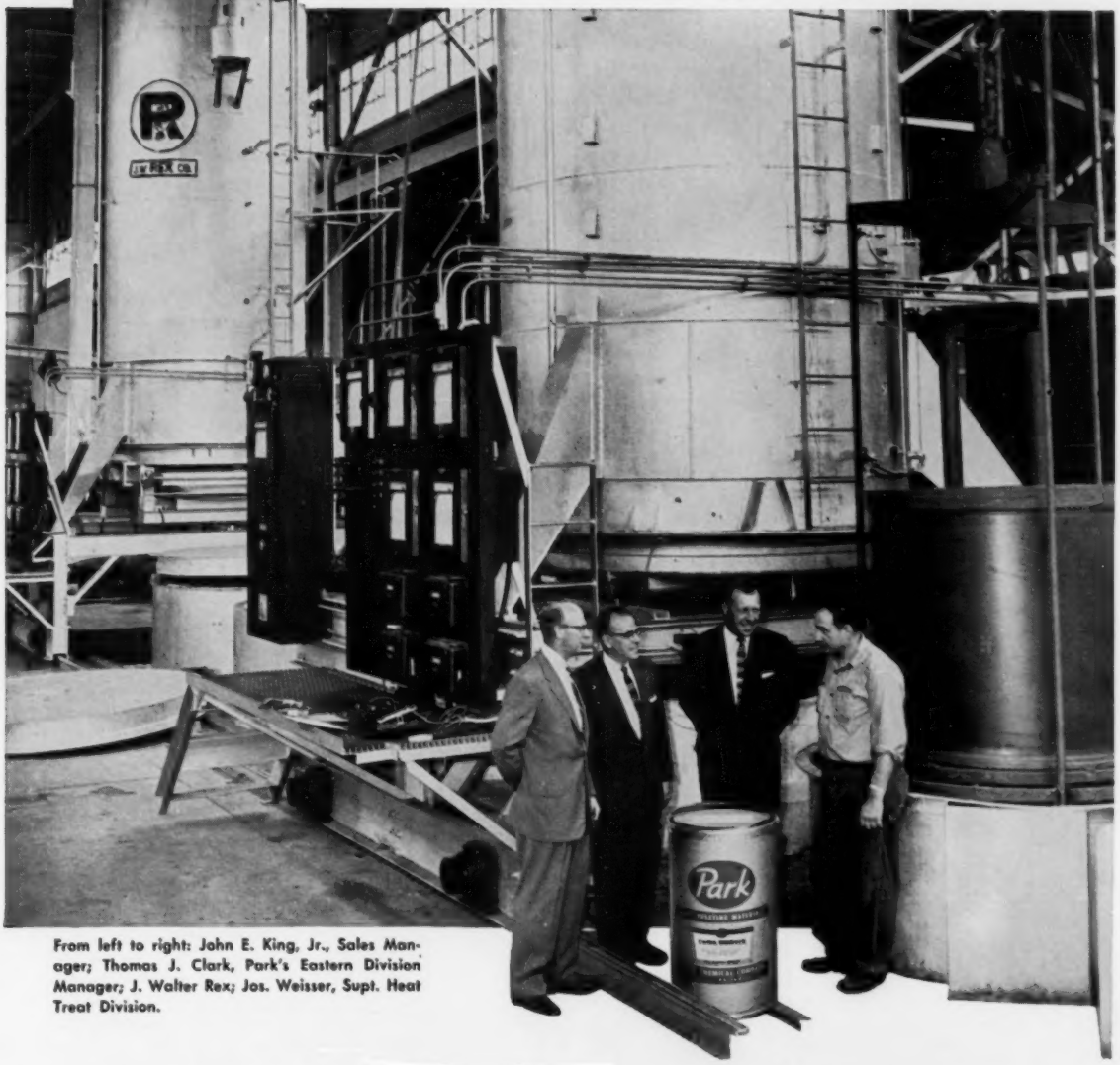
5137 N. 35TH ST., MILWAUKEE 9, WIS.

MAKERS OF WAUKEE GAS FLO-METERS • MIXORS • COMPRESSORS

For further information circle No. 31

"PARK THERMO-QUENCH is doing a job for us"

SAYS J. WALTER REX, PRESIDENT, J. W. REX COMPANY, LANSDALE PENNSYLVANIA.



From left to right: John E. King, Jr., Sales Manager; Thomas J. Clark, Park's Eastern Division Manager; J. Walter Rex; Jos. Weisser, Supt. Heat Treat Division.

"The iso-thermal quenching of large sections for military and civilian purposes requires know-how, good equipment, and quality heat treating materials. We use Park Thermo-Quench salt and find it produces work of uniform quality to meet the exacting specifications of our customers. We have learned to depend on Thermo-Quench for the best results from salt martempering and austempering." Write today for information about Thermo-Quench salt contained in technical bulletin H-19. Park Chemical Company manufactures a complete line of heat treating materials and are happy to help you with your heat treating problems. No obligation, of course. Call or write today.

50th Anniversary

Park

Woodside Rapid Carburizers (Non-Burning-Charcoal-Coke-Specifications) • Park-Kase Liquid Carburizers • Quenching and Tempering Oils • Cyanide Mixtures • Neutral Salt Baths • High Speed Steel Hardening Salts • Iso-Thermal Quenching and Tempering Salts • Protective Coatings (No-Carb-No-Kase-No-Scale-No-Tride) • Carbon Products (Charcoal-Crushed Coke-Pitch Coke-Lead Pot Carbon) • Kold Grip Polishing Wheel Cement • Par-Kem Metal Cleaners • Cutting and Grinding Compounds (Kem-Cut — Kem-Grind — Blue Ice) • Aluminum Brazing Salts and Fluxes

PARK CHEMICAL COMPANY 8074 Military Avenue, Detroit 4, Michigan

For further information circle No. 52

NEWS TO HEAT TREATERS

Continued from page 28

specifically for processing and testing electronic components where

high temperatures under vacuum often are essential.

The radiant heating elements are completely enclosed with no exposed wire heaters to take up space.

An exclusive feature of the new oven is an 11 in. diameter safety glass window in the door which permits 100% view of contents. The heat treated glass will withstand 400 F. thermal shocks with 30,000 pounds psi. modules of rupture. A special spring type hinge keeps door closed even without vacuum.

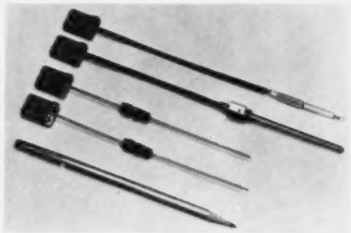
The cabinet is of modern design in heavy gauge steel, with all joints welded. There is a central control panel and an adjustable thermostat. Overall dimensions are 18 in. by 17 in. wide by 18 in. deep.

For further information circle No. 12

Harco Thermocouples

Thrift Therm, a new, miniaturized, low priced thermocouple assembly is now available from Harco Laboratories, Inc., New Haven, Connecticut. Produced in a "family of four" different models, the units' adaptability virtually covers the entire range of thermocouple temperature sensing applications.

Temperature measurement of any medium gases, liquids, semi-solids, etc., range from zero to 2000 F. Response is said to be thousands of times faster than many thermocouples now in use. A welded junction feature greatly facilitates use and insures reliability. The units are small and flexible, allowing multiple



application in small spaces. Their size permits complete instrumentation of complex systems economically as well as completely eliminating need for time consuming, profit consuming thermocouple construction efforts.

For further information circle No. 26

Downtime Cost Reducer

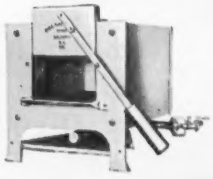
A remote readout device, the Telefier, has been developed by Protection Controls, Inc., Skokie, Illi-

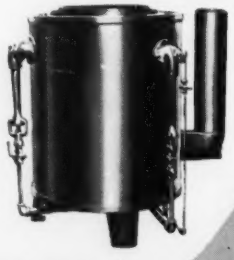
NOTHING heats like... is more modern than... is more economical than... GAS

NO BLOWER OR POWER NEEDED
BUZZER
REG. U.S. PAT. OFFICE
JUST CONNECT TO GAS SUPPLY

INDUSTRIAL GAS BURNERS & FURNACES
Using Only Low Pressure Gas for Clean, Fast, Quiet Heat-Up at Lowest Cost!

BENCH TYPE OVEN FURNACES
For heat treating and pre-heating. Temperatures to 2000° F.





ATMOSPHERIC POT FURNACES
For cyanide, salt bath and lead hardening. Temperatures to 1650° F.

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CHARLES A. HONES, INC.
145 So. Grand Avenue, Baldwin, L.I., New York • BAldwin 3-1110
"BUZZER" Burners & Furnaces for Heat Treating, Melting, Soldering

For further information circle No. 53

FOR SALE
HEAT TREATING
FURNACES

3 — Westinghouse Pusher Type Stress Relieving Furnaces
3 zones of control
145 KW — 440 Volt — 3 Phase — 60 Cycle
Maximum temperature: 1400 degrees F.
Complete with all trays and instrumentation
Like new

1 — Westinghouse Pusher Type Hardening Furnace
2 zones of control
166 KW — 440 Volt — 3 Phase — 60 Cycle
Maximum Temperature: 1800 degrees F.
Complete with all trays and instrumentation
Like new

THE WITLOCK CO.
6400 MIDDLESEX
DEARBORN 1, MICHIGAN
LU. 1-7100

For further information circle No. 54

nois, to provide instant numerical indication showing exact burner position when a flame failure or other fault occurs in multi-burner gas operated heating systems.

The direct reading flame fault indicator reduces downtime because it eliminates time consuming checkout of each burner and various trouble shooting operations. If a flame goes out, or if the flame rod electrode becomes grounded, the

Telefier instantaneously scans all the burner circuits to pinpoint the exact trouble spot. Then it telegraphs the correct signal to the numerical readout indicator. The operator can then immediately attend to defective burner.

The unit was designed for use with the company's own Protectofier Combustion Safeguard, but also operates with other multi-burner combustion controls. The indicator lights can be arranged on the panel in the same physical position and numerical sequence as the combustion safeguards.

For further information circle No. 25

Bright Annealing Process

Allegheny Ludlum Steel Corp. has announced that it is producing, in commercial tonnages at two locations, a new bright annealed stainless steel with a mirror like finish and improved corrosion resistant qualities. The product is going into the 1961 automobiles, into appliances, and other products, the company said.

Continued on page 38

METAL TREATING

has moved its business headquarters

MTI MASTER CRAFTSMEN METAL TREATING INSTITUTE

Metal Treating Magazine has moved its offices to Pompano Beach, Florida. Address all correspondence:

METAL TREATING MAGAZINE
900 N. Federal Highway
Pompano Beach, Florida
Phone: WHitehall 1-5830

DOW

BATCH FURNACES

CONTROLLED ATMOSPHERE EQUIPMENT FOR EVERY APPLICATION

STANDARD HEARTH SIZES

20" Wide—30" Long
24" Wide—36" Long
30" Wide—48" Long

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Phone: KEnwood 2-9100

For further information circle No. 55

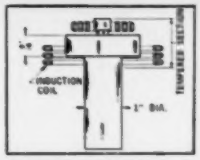
For further information circle No. 56

LepeL

HIGH FREQUENCY INDUCTION HEATING UNITS

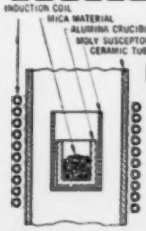
Lepel induction heating equipment represents the most advanced thought in the field of electronics... the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations.

TYPICAL INDUCTION HEATING APPLICATIONS



Punch Heads Selectively Tempered

Diagram shows arrangement for selectively tempering heads of alloy steel punches. The use of a combination type solenoid and pancake induction coil reduces hardness from Rc 55/56 to Rc 41/44, improving resistance to brittle fracture at the head of the punch. In this case a heating cycle of 55 seconds provides uniform tempering. A multiple position fixture, processing 4 pieces at one time, speeds up production.



Heating Non-Conducting Materials To High Temperatures

Laboratory analyses frequently require heating of non-conducting materials to temperatures of 3,000 to 3,500° F. in vacuum or special atmosphere. This can be accomplished by induction heating with the aid of a metal susceptor. Diagram shows the fusion of mica samples in an alumina crucible, using molybdenum susceptor. A ceramic tube surrounding the susceptor isolates the work for fusion in a vacuum. The molybdenum susceptor is heated by induction, which in turn, heats the crucible by radiation.

WRITE FOR NEW LEPEL CATALOG
Electronic Tube Generators from 1 Kw to 100 Kw
Spark Gap Converters from 2 Kw to 30 Kw.

LepeL HIGH FREQUENCY LABORATORIES, INC.
55th ST. & 37th AVE., WOODSIDE 77, N. Y.

MANUFACTURERS' LITERATURE

For your copy circle the number on the Readers' Service Card

Bulletin WS-60, published by Ipsen Industries, describes the installation and operation of the Ipsen water sentinel, a safety device that detects water in enclosed type oil quench tanks. Information includes several illustrations that show the components of the water sentinel as well as the installation of the unit. A graph shows response time for different water contamination levels of quenching oil. Directions on how to order the Ipsen water sentinel are also included.

For further information circle No. 1

A New Catalog describing the complete line of Ajax-Barkling Furnaces has been released by Ajax Electric Company, Philadelphia. Ajax Electric is now handling nation wide sales and service on the gas fired heating and melting furnaces produced for over 38 years by Barkling Fuel Engineering Company, Chicago. The book should be of particular interest to users of this firm's products as well as companies interested in new units.

For further information circle No. 2

Selas Automated Equipment is an illustrated 16 page bulletin which describes machines for heat treating, selective hardening, brazing and soldering, annealing and other processes for heating metals. The booklet, Bulletin S-1058, is published by Selas Corporation, Dresher, Pennsylvania. Contents outline cost cutting features designed into machines for improved production rate, uniform quality, fast heating, reduced manpower skill requirements, effective utilization of floor space, minimum in-process inventory and reduced fuel costs. Typical applications illustrated include electric motor rotor post-heating, austempering typewriter parts, sledge hammer harden-and-draw line, heating for forging ferrous and nonferrous bars and slugs, and brazing of aluminum utensils. Also illustrated diagrammatically are components for controlled combustion systems utilizing high speed gas heating equipment for semi-enclosed or enclosed heating.

For further information circle No. 3

Fundamentals of Vacuum Heat Treating is a 50 page illustrated manual which discusses the basic considerations that apply to heat treating furnaces and the various techniques of vacuum metallurgy. For those considering the problems of treating stainless steels, high speed steels, and the exotic metals, this book is recommended. Beginning with a discussion of vacuum pressures and terminology, various types of vacuum pumping systems, gauges, valves and cold traps commonly used with vacuum furnaces are described. Illustrations show their construction and operation along with the factors that determine their selection for specific applications. The basic design and construction of vacuum heat treating furnaces is considered in detail; including single and two zone muffle and retort hot wall units, as well as cold wall units. Details include a description of control systems as well as a step by step sequence of operations in a vacuum heat treating cycle. Annealing, hardening, tempering, sintering, and brazing under conditions of vacuum are detailed and many specific examples are cited. The manual includes seven tables and charts, 15 drawings, five illustrations, a glossary of terms, and conversion factors for commonly used vacuum terms. Copies can be obtained at $2.00 each by addressing Ipsen Industries, Inc., Rockford, Illinois.

For further information circle No. 4

Furnaces From Sunbeam is the title of Sunbeam Equipment's Bulletin SEC-11. This fold out brochure covers the full line of Sunbeam standard pre-engineered industrial furnace equipment for heat processing. An added feature is a special selection guide which enables readers to select the proper equipment in relation to their particular heat processing requirements.

For further information circle No. 20

Heat Treating Sintered Parts is featured in a 16 page booklet available from Electric Furnace Company, Salem, Ohio. The booklet describes the advantages, physical properties

Continued on page 34

Baskets cast of HT high-nickel alloy give outstanding performance at 1700° F

These baskets carry metal parts through a malleabilizing cycle of 45 to 50 hours at 1600-1700° F.

They're cast of Type HT* nickel-chromium-iron alloy to obtain excellent strength and ductility. These properties, combined with this high-nickel alloy's outstanding resistance to oxidizing atmospheres, result in long service life and dollar-saving economies.

Type HT high-nickel alloy, with its heat resistance and good strength—with its casting ease and economy—proves time and time again to be an ideal choice for furnace baskets, trays and other load-bearing members used in heat treating furnaces.

Wide range of alloys. Type HT alloy is just one of a family of five austenitic casting alloys available for heat treating service. Each—thanks to its high alloy content—provides outstanding resistance to thermal fatigue and most furnace atmospheres.

In this family of high-nickel alloys, you'll find metals that provide good strength and long life at temperatures from 1200 to 2300° F. You'll find alloys with remarkable combinations of properties—properties needed to withstand oxidizing and reducing environments and carburizing and nitriding atmospheres.

Which heat-resisting alloy is best for your needs? You'll find the answer in the 72-page booklet, "Heat Resistant Castings, Corrosion Resistant Castings ... Their Engineering Properties and Applications." Write Inco for your copy today.

*A.C.I. designation.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

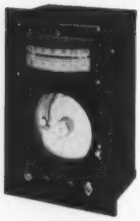
For further information circle No. 57

SPECIFIED
FOR MAKING SEMI-CONDUCTORS

Part of diffusion furnace room, Hoffman Electronics Corporation, El Monte, California. Process is one step in critical manufacture of silicon solar cells.

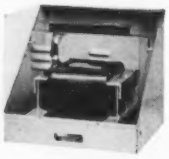
Gardsman by WEST

Model JSBG Stepless Program Controllers



Semi-conductors are grown by a highly integrated process, involving time-temperature control. Only the most precise control delivers the required quality, uniformity, efficiency.

Leading producers of semi-conductors find best results from the market's most compact, integrated Stepless Program Controller: by West. This unit infinitely modulates heater power *and* coordinates time-and-temperature control for even the most unstable systems.



Also available: models combining Gardsman off-on, proportioning or 3-position controllers with programming. All are *tubeless* and noted for minimum maintenance and operating requirements. Ask your West representative or write for Bulletin JSB and JG.

WEST *Instrument* **CORPORATION**
SALES OFFICES IN PRINCIPAL CITIES
W. MONTROSE, CHICAGO 41, ILL.
British Subsidiary:
WEST INSTRUMENT LTD.,
52 Regent St., Brighton 1, Sussex
Represented in Canada by Davis Automatic Controls, Ltd.

the trend is to **WEST**

For further information circle No. 58

and applications of powdered metal parts, discusses design principles and illustrates the different types of furnaces that are being used to heat treat the compacts.

For further information circle No. 23

Characteristics and typical applications of Prestem and Presneal, a low carbon, high molybdenum, high nickel precipitation-hardening die steel, are contained in Data Sheet 3, published by Heppenstall Company, Pittsburgh 1, Pennsylvania.

Prestem, in the prehardened condition, and Presneal, in the annealed condition, was developed especially for hot-working of ferrous and nonferrous metals in presses and upsetting machines. A distinctive feature is its ability to increase "as quenched" hardness by the application of heat — either by a tempering treatment or by the transfer of heat from the hot metal being worked. An increased hardness beyond commercial machinability can be obtained from a prehardened and machinable die block by a simple aging operation. It can be water cooled in service without the hazards that usually attend such practice in ordinary hot work die steels. The data sheet indicates hardness ranges, and gives instructions for heating for hardening, quenching, and aging.

For further information circle No. 22

"CRANCHOKE IS TOPS IN WORK-HOLDING FIXTURE DESIGN. NOTHING STUMPS HIM."

Bright solution for a bright annealing problem

The non-magnetic stainless steel parts above are used by Waterman Products Company, Philadelphia, Pa., in electron tubes. They are bright annealed at 1150 C (2102 F) maximum temperature in a dry hydrogen atmosphere on a 15 minute cycle. The furnace employs an Inconel muffle, water cooled at the rear for quick cooling of the work.

Since close, uniform temperature control and utmost cleanliness are necessary, electric heat offers obvious advantages. Ordinary ribbon elements, however, have a working limit of about 1150 C (2102 F)—too close to the maximum temperature used for practical operation.

What's the answer? The Waterman Products Company solves the problem by having the parts annealed in a 40 kilowatt electric furnace designed and built by the Drever Company, Bethayres, Pa., equipped with GLOBAR® silicon carbide heating elements.

GLOBAR elements can be used with safety to above 1510 C (2750 F). There are no combustion products to cause problems. There are no stack losses, and radiation loss is reduced to a minimum through the use of insulating refractories. The result is greater efficiency and a cooler shop. GLOBAR elements, moreover, make possible a simpler, more compact furnace, saving space and expense.

The advantages of heating with GLOBAR elements often more than cancel out differentials in Btu costs between electricity and other fuels. Why not investigate with your furnace builder—or write to Refractories Division, Globar Plant, Dept. MT-120, The Carborundum Co., Niagara Falls, N. Y.

For latest advances in silicon carbide heating elements... count on

CARBORUNDUM®

For precise, economical electric heating

GLOBAR silicon carbide heating elements

- Shipped from stock or within two weeks.
- Temperatures from 1400 to 2800 F, precisely controlled, independent of atmosphere.
- Easily replaced from outside without waiting for furnace to cool.
- "On line" operation for many applications—no transformer necessary.
- Elements 4" to 105" in length.
- For greater economy in heat treating, brazing, forging, melting, and sintering.

For further information circle No. 59

MANUFACTURERS' LITERATURE

Continued from page 34

Industrial Soldering Irons are featured in General Electric's Bulletin GEC-1545. The bulletin describes General Electric's complete line of production soldering irons for use on all electronic equipment, meters, and instruments. Publication also discusses special irons and transformers for soldering printed circuits, transistors, and miniature and subminiature components for aircraft and missile assemblies. Irons are rated at six, 115, 120 and 230 volts, 12 to 1250 watts. The brochure also includes a listing of all ratings, prices, types of renewal tips and shows optional equipment available.

For further information circle No. 21

The new **Hayes Recirculating Molecu-Dryer Type MS-RD** complete with atmosphere recirculating unit, and designed specifically around Linde Company's 5A Molecular Sieve adsorbent material, is described in a bulletin published by C. I. Hayes, Inc. of Cranston, Rhode Island. The illustrated bulletin lists numerous applications of the new unit, such as air drying, dry box assembly of transistors and other electronic parts, gas drying and separating, and other uses calling for dew points of -100 F. or lower. Design and controls are also pictured, together with a typical dry box flow diagram with components of the new Hayes gas-air drying unit arranged for semi-automatic operation. A table of models lists numerous available standard sizes with flow capacities from 500 to 16,000 SCFH.

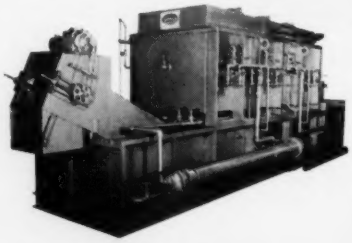
For further information circle No. 24

Metal Digest, the bimonthly external house organ of Buehler, Ltd., Issue No. 4, Volume 6, describes in detail the new Buehler Simplimet Press used for convenient and rapid mounting of metallurgical samples. The eight page booklet is graphically illustrated with photos and descriptions of the system and its operation.

For further information circle No. 33

Shuffle Hearth Furnace

A shuffle hearth furnace designed for automatic continuous atmosphere heat treating and quenching is being marketed by Sunbeam Equipment Corp., Meadville, Pennsylvania.



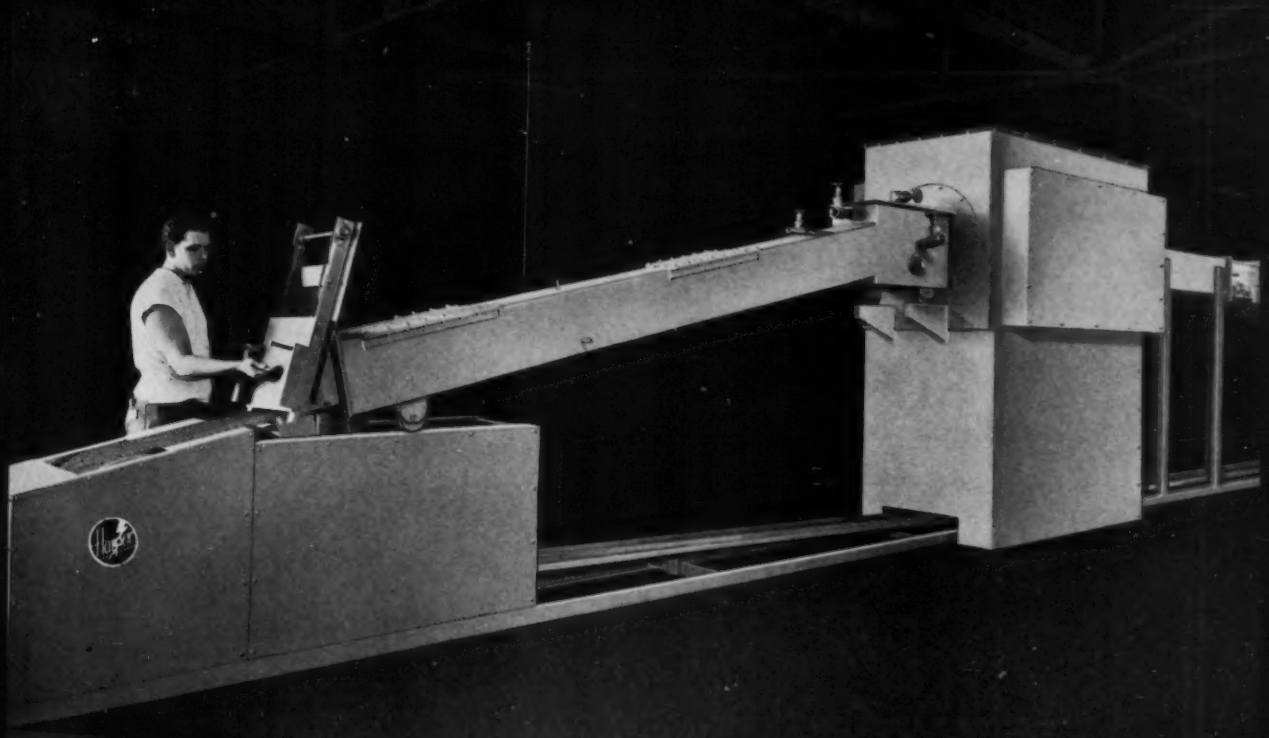
Especially adaptable to processing small parts such as fasteners, nails and bearing parts, the furnace can be built in a range of sizes which will process from 50 to 1200 pounds per hour.

For further information circle No. 6

HEAT & CORROSION RESISTANT
Castings & Fabrications
FURNACE BASKET
This pit type furnace basket, employing cast bottom grids and trunnions with sheet sides, is available in many sizes and designs. The cast bottom grids provide maximum load carrying ability, while the sheet sides provide maximum heat transfer and maximum work capacity with minimum weight. Available with and without trunnions and lift rods. Also available with stacking feature and drop bottom arrangement. Let our engineering staff help you solve your heat resisting alloy problems.
GENERAL ALLOYS COMPANY
FABRICATED ALLOY DIVISION
390 WEST FIRST STREET • BOSTON 27, MASSACHUSETTS

For further information circle No. 60

PROCESSING A VARIETY OF METALS:



LOW DEW POINTS HELD FOR CRUCIAL WORK

Shown above is Harper's new version of the hump-type mesh belt furnace. Featuring several design innovations and improvements, it's engineered to provide low dew point atmospheres for continuous brazing, annealing, hardening, and sintering.

Materials to be treated can be light or medium weight — in multiple sizes and shapes. The work can be loaded directly on the belt or in lightweight baskets or carriers. With the elevated heating chamber providing a natural atmosphere seal, far less hydrogen or dissociated ammonia is consumed than with a straight-thru furnace. Variable speeds permit treatment of materials of different thicknesses and time-temperature requirements.

Available in both electric and gas heated models, these modernized hump-type mesh belt furnaces are ideally suited for processing a variety of metals in the electronic, aircraft, guided missile, space vehicle, nuclear energy, and other fields. They're representative of the way in which Harper is continually updating its complete lines of box, pusher, mesh belt, roller hearth, bell and elevator furnaces.

Detailed information can be obtained by writing for new illustrated Bulletin HMB-60. Harper Electric Furnace Corp., 51 River St., Buffalo 2, N. Y.

HARPER ELECTRIC AND GAS FURNACES

FOR BRAZING, SINTERING, ANNEALING, HARDENING, AND FORGING IN RESEARCH AND PRODUCTION

For further information circle No. 61

Easy Operation, Precision Measurements ...with Wilson "Rockwell" Hardness Testers

• No matter what your hardness testing requirements are, there's a Wilson Rockwell instrument to do the job easily and accurately. Long recognized as the world's standard of hardness testing accuracy, Wilson instruments on the production line and in the laboratory offer these advantages:

Accuracy—Each instrument is precision-built, with exact calibration, for consistently correct results.

Easy operation—Even an unskilled operator can get perfect readings. All controls conveniently grouped.

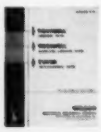
Long life—Simple design, rugged construction make Wilson instruments as durable as a machine tool.

Easy maintenance—Interchangeable mechanisms, with spindles mounted in oil-less bearings.

Complete line—Choose from the widest variety of instruments available, including semi and fully automatic models.

Wilson "Brale" Diamond Penetrators Each diamond is cut to an exact shape. A comparator check and microscopic inspection of each diamond assure perfect readings every time.

Write for details—Ask for Catalog RT-58. It gives complete information on the Superficial tester as well as on the full line of Wilson Rockwell hardness testers.



WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-R Park Avenue, New York 17, New York

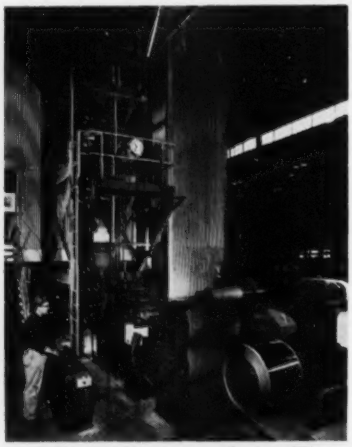
For further information circle No. 62

NEWS TO HEAT TREATERS

Continued from page 31

"This new product represents a major improvement in the surface luster and corrosion resistance of stainless steel," William B. Pierce, vice president in charge of sales, said. "And for the first time, bright annealed stainless strip is available in tonnage quantities in the types, widths and gauges most used by auto and appliance manufacturers."

Bright annealed stainless is being produced in new facilities at the company's West Leechburg, Pennsylvania works and at the Wallingford, Connecticut plant of its subsidiary, the Wallingford Steel Company. Large new vertical electric furnaces for continuous bright annealing of stainless steel strip, up to 27 in. in width, have been placed in

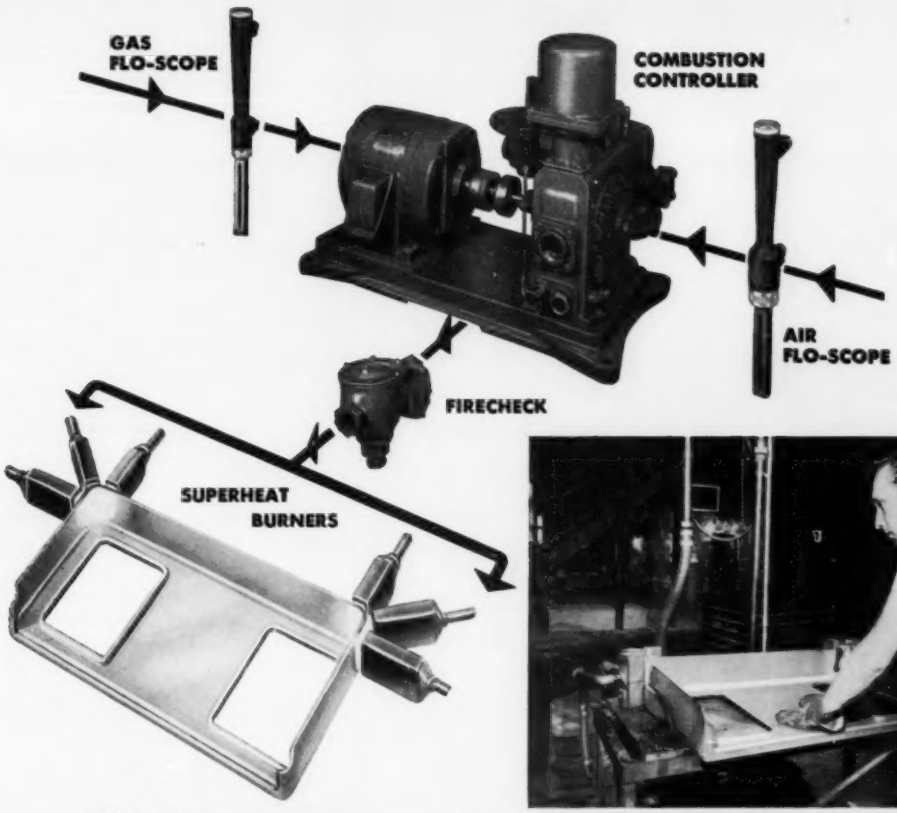


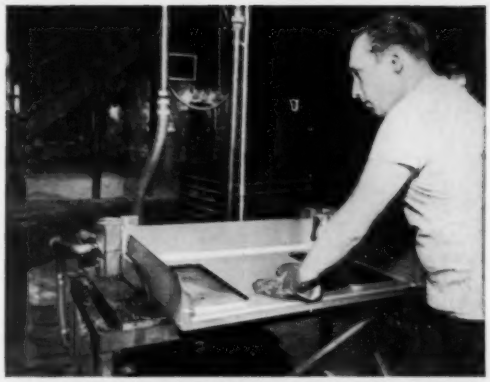
operation at the two plants. These furnaces, which tower about 100 ft. high, are the largest and most advanced bright annealing units in production in the steel industry. Built by General Electric Company, they are the first furnaces in the industry to produce bright annealed stainless strip in commercial tonnages in a broad range of types and sizes of stainless.

Bright annealing of limited quantities of thin gauges and narrow widths of stainless steel has been a practice in the stainless industry for more than 10 years. Wallingford Steel has offered bright annealed, thin-gauge strip since 1949. The

Continued on page 40

NEW SLANTS ON HEAT PROCESSING FROM SELAS





With this simple set-up, one man can anneal stove tops as fast as they come off the mechanical press. The top is simply placed in the jig and the Selas combustion system does the rest automatically. The three Superheat burners at each corner provide the right annealing temperature for the prescribed time, and at a fuel saving of 1/3 for Welbilt.

Selas Superheat Burners help double production, reduce fuel costs one-third at Welbilt Corporation

Welbilt Corporation, Maspeth, N. Y., formerly annealed the front corners of stove tops with an oxy-acetylene torch. Now with Selas Superheat burners and a Selas combustion system, using only commercial fuel gas and air—with no bottled oxygen—Welbilt has eliminated rejects and a production bottleneck. As each stove top is placed in a jig, the Superheat burners are brought instantly and automatically to heat to anneal the corners correctly and uniformly . . . *in one-half the time formerly required!*

To accomplish this efficiently, the Selas Superheat burners are supported by *other* components in the Selas combustion *system* including:

- *Combustion Controller*—by delivering gas-air mixture to burners at preset ratio and pressure, makes possible fast heating and close control. Completely automatic. (Bulletin CC-2)
- *Flo-Scopes®*—installed at the inlets to the Combustion Controller, measure rates of flow of gas and air and permit accurate determination of gas-air mixture ratios. (Bulletin FS)
- *Firecheck*—gives complete assurance of safety by automatically extinguishing any flashbacks that may occur. Factory Mutual approved. (Bulletin CS-2)

These combustion components are available *individually or as a complete combustion package.*

Selas Superheat Burners (Bulletin SB-1) can be installed in open arrangements . . . in-line . . . in circular rings . . . in spirals . . . individually . . . in opposed pairs. Also special Superheat designs can be custom-built to meet your specific needs. Available, too, are Selas Duradiant®, Refrak, Spear-Flame and Ribbon burners. Mr. P. Berg, General Industry Division, will be happy to furnish literature and information.

SELAS CORPORATION OF AMERICA
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HEAT AND FLUID PROCESSING ENGINEERS
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For further information circle No. 63

Control Quenching to Improve Heat Treating

● The NIAGARA Aero HEAT EXCHANGER transfers the heat from the quench bath to atmospheric air. It never fails to remove the heat at the rate of input, giving you real control of the quench bath temperature. You prevent flashing of oil quenches. You improve physical properties, save loss of your product from rejections, get faster production, increase your heat treating capacity.

You have a closed system, freedom from dirt and scale. You avoid water supply and disposal problems.

Write for Bulletin 120 and 132

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Dept. MG-12, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities

For further information circle No. 64

NEWS TO HEAT TREATERS

Continued from page 38

new furnaces of Allegheny Ludlum and Wallingford — representing a combined capital investment of more than $2,000,000. — now bring the process into commercial availability for all users of the bright finishes of stainless steel.

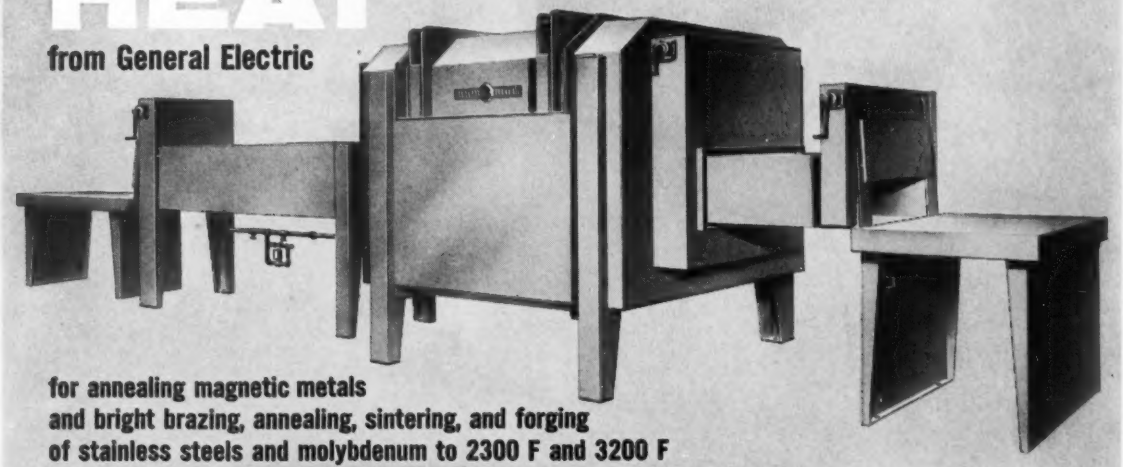
Pictured here is a general view of the exit side of the new continuous bright anneal furnace at the West Leechburg Works of Allegheny Ludlum Steel Corp. The furnace itself, inside the ribbed tower in background, is almost 100 ft. high.

For further information circle No. 29

Avco's Honeycomb Process Announced

A new and more economical method for producing stainless steel honeycomb for space vehicles, missiles, and supersonic aircraft, such as the B-70, has been announced by

HEAT
from General Electric



for annealing magnetic metals and bright brazing, annealing, sintering, and forging of stainless steels and molybdenum to 2300 F and 3200 F

NEW Molybdenum Resistor Box Furnaces from General Electric give high temperature operation on a continuous basis with little or no maintenance. Available with cooling chamber (shown above) for temperatures of 2300 F and 3200 F; or without cooling chamber at 3200 F. Furnaces with cooling chamber can be used where atmosphere purities as high as 99.995 percent are required. Molybdenum heating units give rapid heating at high temperatures. Problems of low heating rates, poor heat distribution, and muffle maintenance are eliminated with this years ahead furnace design.

Ask your General Electric Sales Engineer for complete data on these new G-E Molybdenum Resistor Box Furnaces or write for bulletin GED-4305. General Electric Company, Schenectady 5, N. Y.

736-08

Progress Is Our Most Important Product

GENERAL ELECTRIC

For further information circle No. 65

Avco Corporation's Nashville division at Nashville, Tennessee.

Known as the Avcoramic tooling method, the technique makes possible the brazing of very large pieces of stainless steel honeycomb in almost any shape or size and to exacting specifications. In addition, the new method will result in significant cost savings from present day techniques.

Commenting on the new method, John Mihalic, Nashville division president and Avco vice president, said the Avcoramic process "will make possible substantial savings in producing brazed stainless steel honeycomb panels for the aircraft of the future as well as for other applications." The Nashville Division has a contract with North American Aviation, Inc. to produce sections of the aft fuselage and some of the bulkheads for the B-70 Valkyrie bomber that will fly at three times the speed of sound. Because it is lightweight, heat resistant and has a very high strength to weight ratio, stainless steel honeycomb is used in the fuselage and wings of the huge intercontinental bomber, the first prototype of which is now under construction at Los Angeles.

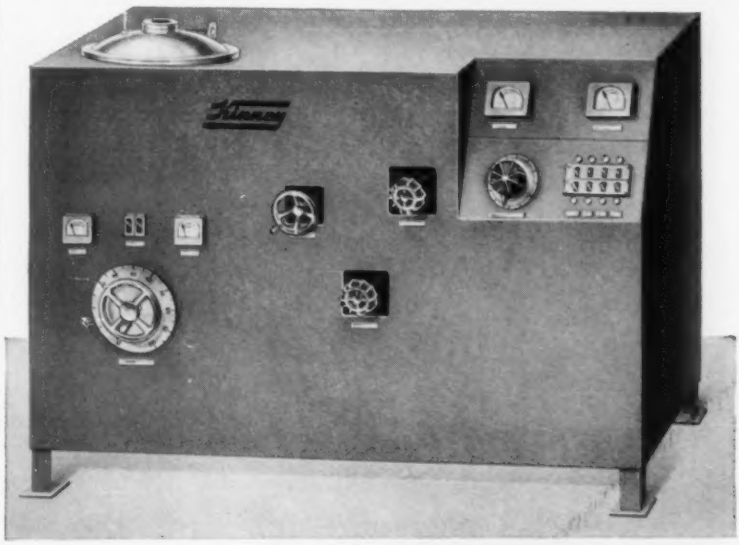
In explaining the Avcoramic process, Mihalic said, "We first make brazing platens out of ceramic materials. It can be of any size and almost any shape that is necessary. Holes are put through the material for both heating elements and for cooling purposes.

"The surfaces of the ceramic elements, which are finished to close tolerances, act as contour forms for brazing the stainless steel honeycomb," he went on to explain. "After cleaning, stainless steel sandwich materials are enclosed in a steel envelope and placed between the matched ceramic platens. To assure close contact of the parts to be brazed, a vacuum is maintained in the envelope and an external pressure is applied to the ceramic platens."

The ceramic material then is heated electrically to the proper

Continued on next page

VACUUM SINTERING



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WRITE: for Bulletin No. 4510 Describing New Developments in Kinney High Vacuum Furnaces.

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positive temperature control

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2. Pyrotac—a safety excess temperature cut-out or alarm.

Dependable automatic control of temperatures in heat treating furnaces, ovens, plastic moulding, cooking vessels or for any constant temperature requirement. Operates to prevent overheating even with power failure.

The Alnor Flux Gate Sensing Coils

The simple, rugged circuitry in the Pyrotroller has a minimum of components that operate well below their rated capacities. The circuit is not critically tuned and there is no need for repeated adjustment, no shifting of the control point, no need for preselection of the one standard vacuum tube. Sapphire jewel bearings and the very high Alnor standard of precision construction makes the Pyrotroller extremely accurate particularly in the low temperature ranges.

The Alnor Pyrotroller is available in a wide range of temperatures, —100° F. through various maximum temperatures up to 3000° F. The minimum scale span is 400° F. and various ranges can be supplied to meet your particular installation. Write for complete information. Our engineering service is available on special requirements.

ALNOR INSTRUMENT CO.

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Room 556, 420 N. LaSalle St., Chicago 10, Illinois

For further information circle No. 67

NEWS TO HEAT TREATERS

brazing temperature, and held there for a short, controlled time period. Then the ceramic platens and the stainless steel honeycomb sandwich are cooled very rapidly by air forced through the holes in the ceramic material. Even sub-zero temperatures are possible while the honeycomb assembly is still in the Avcoramic tool. Finally, to achieve maximum strength, the panels are aged at an elevated temperature.

Mihalic stated that the "key to the new process is the ceramic material developed by Avco. It has excellent resistance to thermal shock and can be cast with tolerances of three thousandths of an inch. Yet, with a minimum of effort, it can be worked into any required shape."

Early work on this material was done at Avco's Research and Advanced Development Division in Wilmington, Massachusetts. Subsequent development in its application to brazed honeycomb was continued at Nashville.

For further information circle No. 13

Electronic Control System

A new miniature electronic control system has been announced by Leeds & Northrup Company. Called the M-Line Temperature Control Loop, the system provides all of the required instrumentation to measure and control a furnace. Instruments used in the Loop include: a temperature transmitter, single pen Speedomax recorder, a control system using a controller, set point unit and auto-manual station, and a magnetic amplifier.

The M-Line Temperature Control Loop offers maximum flexibility in operation with the provisions for integrating data handling and computing equipment. All of the components incorporate the miniature concept of design and consist of modern plug in units. Advantages of the temperature loop include fast electrical response both

Continued on page 44

CONTINUOUS ANNEALING

Concluded from page 8

opposite side of the machine. A 20 min. trip through the cooling tunnel brings the temperature of the stacks down to approximatey 700 F., after which they emerge from the tunnel exit near the operator and are unloaded.

Stator and rotor lamination annealing operations at Century Electric have not only been shortened with this new automated method, but start up time is also lessened every morning. Only one half hour is required to bring the Duradiant burner fired heating tunnel up to temperature.

While the machine has greatly increased production rates, it is maintaining, with minimum rejects, Century Electric's strict quality requirements for stator and rotor laminations. Strains in laminations, resulting from the punch press, are effectively relieved, as evidenced by rigid tests made on the oxide coatings, which must conform to exact specifications for lowering eddy currents and hysteresis loss in final assembled motors.

Other economic advantages realized and which have helped repay the original equipment cost many times over, include: only one unskilled operator is required to load and unload machine, occasional replacement of burner tips has been the only upkeep cost, sizable fuel savings have resulted from the increased speed in heating workloads, and because less heat is wasted by the direct fired method used. • • •

A PENSION PLAN

Concluded from page 11

self" project. It calls for an expert who knows what the Internal Revenue Service will permit, and not permit, in a tax deductible plan. Usually this expert is an independent pension consultant—a man who has no "pet" plan to sell. You can depend on his advice being impartial. With your specifications clearly in mind, he is in the best position to design them into a plan which ideally fits your needs and your budget. The money he will save you, by making certain that you get the most value for your pension dollars, will repay his modest fee many times over.

The real savings of a pension plan begin, however, in its ability to attract and keep valuable key men on your team—and in its tax savings for company owners. If you are still passing up these advantages, it may be time to take a hard look at this fast growing form of deferred compensation. You may find it is actually costing you money to put off a pension plan. • • •

WHAT WOULD YOU DO?

Concluded from page 12

THE AWARD. The arbitrator said that the change was made for the purpose of securing a more economical distribution of manpower, but in view of the restrictions of the contract, the desirable aim was not by itself sufficient to justify the change, particularly as the conditions which prompted management to set up a new shift existed when the contract was negotiated.

• • •

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1—27x36 Tumble-Blast Wheelabrator with Floor Loader.

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Two series (8012 and 8008) of "space saver" combination heat treating furnaces are produced by Lucifer Furnaces, Inc. Hardening, drawing or preheating, and quenching operations can be performed with one furnace. Each furnace has separate controls permitting independent operation of each unit. The 8012 series chambers operate at 2300, 2000 and 1250°F.; while the 8008 series chambers reach 2300, 2000, and 800°F. The furnaces operate on standard line voltage . . . no transformer necessary. Twenty standard low-cost models are available and each is a complete unit . . . just connect to power supply.

For information about the "space savers", our complete line, or free engineering advice, call on . . .

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For further information circle No. 70

....tough on retorts

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demands Exacting Fabrication

This 8-foot-high bell retort fabricated of ¼-in. RA 330 stainless by Alloy Engineering is used for equalized vacuum brazing in an electric refractory furnace. Designed for 2100° service at a 4 micron/1000 micron equalized vacuum, the retort is subject to cyclic thermal stresses reflected by a 1-in. increase in diameter at operating temperature.

The upper cylinder, 4 feet in diameter, tapers to 6½ feet at the bell base where it is joined to the 1¾-in. mild-steel base ring grooved top and bottom for O-ring vacuum seals.

Alloy's experience with performance factors of high temperature equipment enables it to assist in engineering with recommendations as to construction, type and gauge of material. Careful fabrication, preparation and welding enables Alloy to produce retorts, muffles, and fixtures for trouble-free high-temperature service.

Rely on Alloy's experience and facilities to help solve your heat treating problems.

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Custom engineered and fabricated to your service needs.

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NEWS TO HEAT TREATERS

Continued from page 42

in measurement and control actions, wide range of control adjustments and extreme ease of maintenance.

For further information circle No. 72

L & N Design Innovations

Leeds & Northrup's 8692 Single-Range Portable Temperature Potentiometer and 8693 Double Range Portable Temperature Potentiometer are said to offer design innovations never before obtainable in conventional temperature indicators. They are available in any of 31 temperature ranges and four millivolt ranges, all of which are quickly interchangeable.

An operator can change a range with a screwdriver in minutes merely by inserting a new circuit panel, 27 ½ in. scale and, if necessary, binding post studs. This eliminates the need for purchasing a new potentiometer or performing tedious soldering to change range coils.

A reference junction coil built into the circuit panel automatically compensates for the specific type of thermocouple used. Both potentiometers can provide an output in millivolts, equivalent to the temperature setting of the instrument, for use in checking similar potentiometers, recorders and controllers. The limit of error is to ±0.2% of range span.

The 8692 is calibrated for one type of thermocouple for temperature measurements, or for millivolt measurements.

For further information circle No. 73

THE LATEST WORD IN HEAT TREATING

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Rotary Retort or Shaker Hearth . . . both deliver maximum efficiency and economy of any heat treating process.

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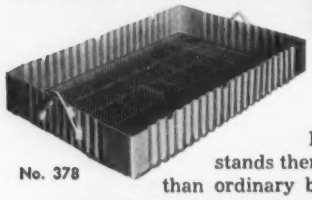

No. 378

The Cor-Wal design of baskets (and other heat treating containers too) increases service life by providing a unit that withstands thermal stresses for a much longer period than ordinary baskets. The design also provides for a lighter weight construction. A Cor-Wal basket is shown in the heat treating department of Abegg-Reinhold Co., makers of oil well drilling equipment—one of many manufacturers who are speeding operations and cutting costs with Cor-Wal baskets. Send for Catalog 60.

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HEAT TREATING EQUIPMENT

4825 W. Cortland Street Chicago 39, Illinois

For further information circle No. 75

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To Produce Industry's ***Toughest*** *High-Strength Alloy Bolts—from* ***Heat-Treating*** *through* ***Testing****—Voi-Shan chose*

Pacific FURNACES AND INDUSTRIAL EQUIPMENT

When difficulties were encountered in meeting hardening requirements of high-strength alloy bolts, the heat-treat department at Voi-Shan Manufacturing was authorized to find the best furnace equipment possible to eliminate this problem.

After a survey of available equipment, three Pacific Scientific Carburizers, a Pacific Karbomatic, three water-jacketed cooling pits and a 1000 CFH Nitrogen Generator were selected as *best for the job!* In addition, Pacific's Industrial Division supplied one Waukee Washer for cleaning treated bolts, and two Wilson Rockwell Hardness Testers for checking all bolts before shipment.

In use now for over a year—drawing, normalizing, annealing and hardening alloys such as A286, Vasco Jet 1000, Inconel monel 5616, Udimet 500, 8740 and 4340—the Pacific installation has lived up to expectations.

Operation of these Pacific furnaces is a simple one man job. The Pacific Karbo-Matic provides completely automatic operation. A control console is provided with the three Pit Carburizers which provide automatic hardening between 1500° F. and 1900° F. After heating, parts may be aged or tempered under atmosphere in the cooling pits to room temperature.

Perhaps a Pacific furnace could be the solution to a heat-treating problem of yours. A complete line of Pacific furnaces is available for practically every heat-treating need. In addition, Pacific can supply a full range of heat-treating accessories such as washers, molecular sieves, thermocouples, and physical testing equipment.

Call the nearest Pacific office now to investigate. A Pacific engineer will be glad to help you, at no obligation, of course.

*TRADE MARK

Pacific

Creative Development and Manufacturing in Furnace Design

GAS OR ELECTRIC INDUSTRIAL HEAT TREATING EQUIPMENT

PACIFIC SCIENTIFIC COMPANY

LOS ANGELES
SAN FRANCISCO
SEATTLE
PORTLAND, OREGON
ARLINGTON, TEXAS
SAN DIEGO
DENVER

PACIFIC SCIENTIFIC COMPANY, P.O. Box 22019, Los Angeles 22, Calif.

☐ Please send me information on custom designed furnaces. ☐ Please send me your FREE Brazing Catalog. ☐ Please send me a copy of your new catalog and full information on Pacific Heat Treating Equipment.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

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Now!

AJAX-BARKLING

GAS-FIRED HEAT TREATING AND MELTING FURNACES!

- Pot types for use with salt or lead
- Small tool and shop types for general hardening
- Full muffle types
- Types for all non-ferrous melting
- Large and small oven furnaces
- Oven- and slot-type forge furnaces

. . . and various others

BACKED BY A 38-YEAR RECORD OF DEPENDABILITY

Write for Ajax-Barkling Catalog 106-A

To Ajax-Hultgren and Ajax-Ankersen salt bath furnaces has now been added the rugged line of Ajax-Barkling oil or gas-fired furnaces for a wide variety of heat treating needs. These Barkling furnaces—widely used in the Midwest for over 38 years—will now be handled and serviced by 20 Ajax sales engineering groups located throughout the U. S.—and backed throughout by the internationally-famous Ajax "know how" of modern heat treating methods, procedures and equipment.

AJAX ELECTRIC COMPANY

940 Frankford Avenue, Philadelphia 23, Pa.

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